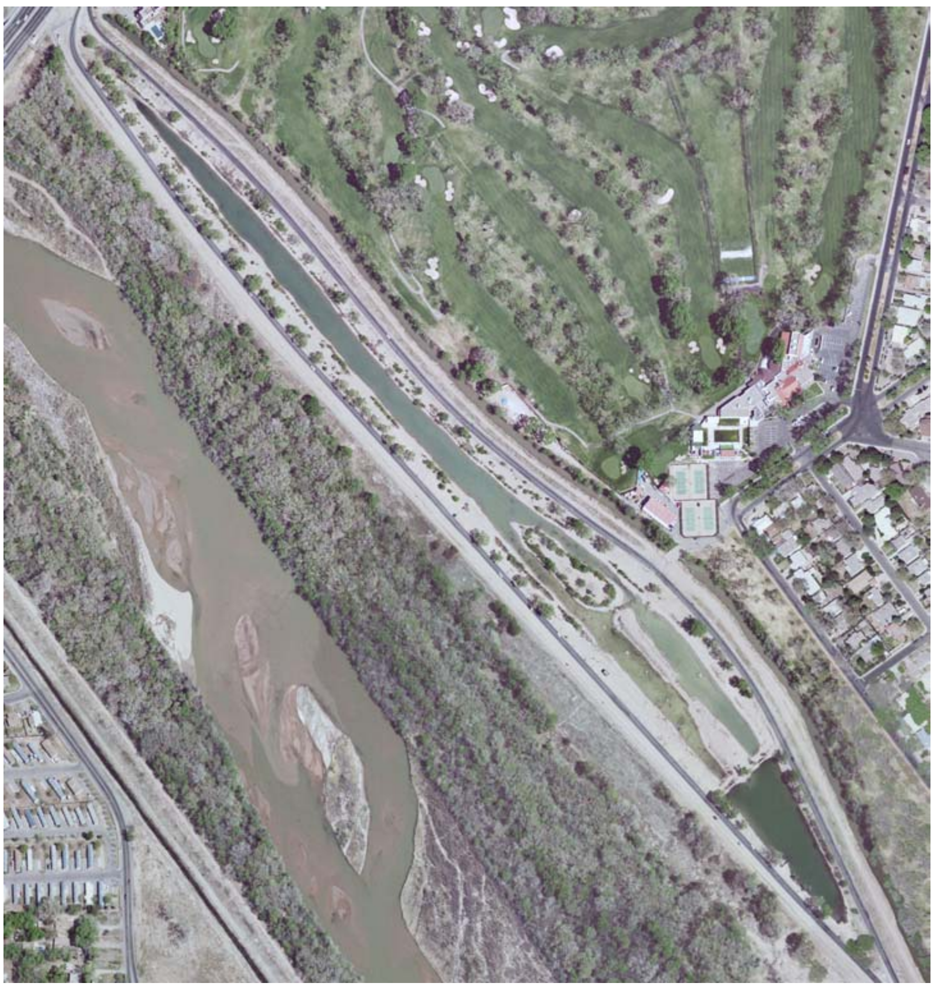
US Army Corps of Engineers®
Albuquerque District

DRAFT DETAILED PROJECT REPORT AND ENVIRONMENTAL ASSESSMENT FOR ALBUQUERQUE BIOLOGICAL PARK WETLAND RESTORATION PROJECT

ALBUQUERQUE, NEW MEXICO
(Section 1135 Program)



This is a current aerial photograph (2001) of the Tingley Ponds and adjacent riparian area next to the Rio Grande.

Prepared by U.S. Army Corps of Engineers Albuquerque District,
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November 2003

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U.S. ARMY CORPS OF ENGINEERS

ALBUQUERQUE DISTRICT

DRAFT FINDING OF NO SIGNIFICANT IMPACT

ALBUQUERQUE BIOLOGICAL PARK WETLAND RESTORATION PROJECT, ALBUQUERQUE, NEW MEXICO

(Section 1135 Ecosystem Restoration Program)

Due in part to Jemez Canyon and Cochiti Dams, placement of levees and installation of Kellner jetty jacks for bank stabilization along the Rio Grande in the City of Albuquerque, has resulted in the isolation of Tingley Ponds from the Rio Grande and reduced the number and intensity of overbank flooding. Opportunities for restoration include creating sustainable aquatic habitat and native fishery for Tingley Ponds. Adjacent to the Tingley Ponds lies an opportunity to restore the riparian community next to the Rio Grande. Water is available to create wetland communities in the riparian area adjacent to the Tingley Ponds. Other riparian restoration opportunities include: jetty jack removal, exotic/invasive species removal, native plant establishment and enhancing hydrology in the bosque.

All alternatives considered Tingley Pond restoration and wetland creation. The goals and outputs were identified and small variations or management measures were used to evaluate alternatives. This allowed the team to determine the most cost-effective version of the alternative. Alternatives were analyzed where wetland and pond incremental features (size, depth, type of aeration) were compared to environmental outputs. An ideal reference reach based on a mixed riparian wetland community was used as the preference within the current river regime.

The planned action would result in only minor and temporary impacts on air quality, land use, recreation, and noise levels. The following elements have been analyzed and would not be significantly affected by the planned action: socioeconomic environment, air quality, water quality, noise levels, flood plains, riparian areas, wetlands, waters of the United States, biological resources, endangered and threatened species, and cultural resources.

The planned action has been fully coordinated with Federal, Tribal, and local governments with jurisdiction over the ecological, cultural, and hydrologic resources of the project area. Based upon these factors and others discussed in detail in the Detailed Project Report/ Environmental Assessment, the planned action would not have a significant effect on the human environment. Therefore, an Environmental Impact Statement will not be prepared for the conduct of the subject Section 1135 ecosystem restoration project.

Date

Dana R. Hurst
Lieutenant Colonel, EN
District Engineer

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LIST OF ACRONYMS

BMP	Best Management Practice
BOR	Bureau of Reclamation
CBC	Christmas Bird Count
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
DPR	Detailed Project Report
EA	Environmental Assessment
EPA	Environmental Protection Agency
gpm	gallons per minute
HDPE	high density polyethylene
HTRW	Hazardous, Toxic, and Radiological Waste
H:V	Horizontal over Vertical
ICA	Incremental Cost Analysis
MOU	Memorandum of Understanding
MRGCD	Middle Rio Grande Conservancy District
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMAC	New Mexico Administrative Code
NMDGF	New Mexico Department of Game and Fish
NMISC	New Mexico Interstate Stream Commission
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Commission
P.L.	Public Law
RGVSP	Rio Grande Valley State Park
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WRDA	Water Resources Development Act

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SECTION 1. PURPOSE AND NEED

1.1 STUDY AUTHORITY

This feasibility study is being conducted under the authority of Section 1135(b) of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662). The objective of this authority is to improve the quality of the environment through modification of the structure or operation of existing water resources projects constructed by the U.S. Army Corps of Engineers (Corps), providing such modifications as are feasible and consistent with the original project purpose. Improvements in ecosystem structure and function in areas adversely affected by such projects are also included in this authority.

The placement of levees and installation of Kellner Jetty jacks for bank stabilization on the Rio Grande and some of it's tributaries (P.L. 80-858), Jemez Canyon Dam on the Jemez River was completed in 1953 authorized for sediment control (P.L. 80-858), and Cochiti Dam on the Rio Grande, completed in 1975, authorized for flood and sediment control (P.L. 86-645), have contributed, in part, to the degradation of riparian/wetland ecosystem functions and values. All of these projects are part of the comprehensive flood control plan for the Rio Grande watershed in the Flood Control Act of 1948.

1.2 BACKGROUND AND PROBLEM IDENTIFICATION

The Albuquerque Biological Park Wetland Restoration Project is located in the City of Albuquerque, Bernalillo County, New Mexico (Figure 1.2-1). Tingley Ponds and the wetland creation area are located south of Central Avenue and east of the Rio Grande. The Tingley Ponds and wetland creation project areas are located between the Albuquerque Botanical Gardens and Aquarium and the Albuquerque Biological Park. All of these features are located within a mile of one another.

In 1933, Mayor Clyde Tingley convinced the Middle Rio Grande Conservancy District (MRGCD) to realign its levees and divert Rio Grande surface water into a small lake. Tingley Beach was thus developed as a municipal bathing beach, with Tingley Drive as its access. Facilities included diving platforms, bathhouses, a slide, and boat dock. The ponds were originally 250 feet wide and 10 feet deep and were connected to the Rio Grande via a surface water connection (City of Albuquerque, 1991).

By 1940, water quality and quantity problems emerged including outbreaks of avian botulism. By 1948, the ponds were disconnected from the river, due to the newly engineered levee system and the main water source became groundwater infiltration. This did not supply enough water to the ponds; therefore, groundwater wells were drilled to supplement water to the ponds.

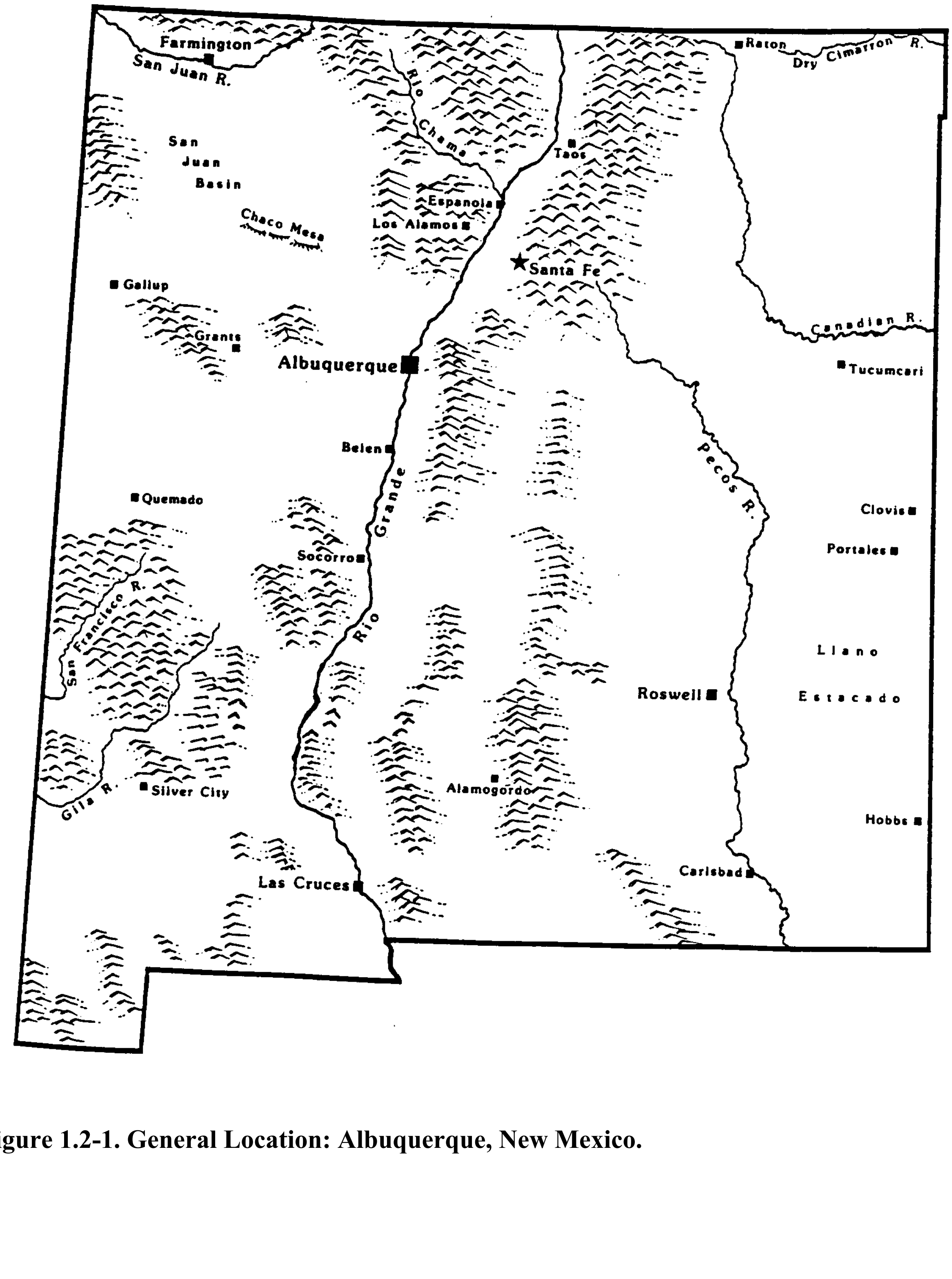


Figure 1.2-1. General Location: Albuquerque, New Mexico.

By August 1952, the ponds were permanently closed to swimming because no solution to the water quality problems could be found. Sometime in the 1950's and 1960's, Tingley Ponds were reclaimed as a duck and fishing pond. Since that time, continual problems with water quality and outbreaks of avian botulism have been common. Pond depth has decreased to 3-6 feet due to soil erosion problems (City of Albuquerque, 1991).

The riparian forest or bosque located along the Rio Grande has also been altered due to the levee system and upstream flood control structures. Several Federal flood control projects have altered the riparian ecosystem along the Rio Grande. Regulated river flows have reduced overbank flooding in the project area, which has led to aging native riparian vegetation and a greater amount of exotic/invasive vegetation. Due to flood control projects and riparian restoration and wetland creation to enhance this area of the riparian ecosystem. In response to these problems, the City initiated a request to the Corps to pursue this Section 1135.

Section 1135 project implementation requires a non-Federal Sponsor to provide 25 percent of the total project costs. In October, 1999 the City signed a letter of intent to cost share the activities outlined in a jointly prepared Section 1135 program Preliminary Restoration Plan. Corps Headquarters approved initiation of the present feasibility study on November 2, 1999. Cost-sharing requirements are discussed in detail in Section 5.7.

1.3 STUDY PURPOSE AND SCOPE

The purpose of this Section 1135 Program feasibility study was to investigate and recommend cost-effective environmental quality improvements along the Rio Grande within the Tingley Pond area. This Detailed Project Report/Environmental Assessment (DPR/EA) addresses only those activities proposed for implementation by the U.S. Army Corps of Engineers under the Section 1135 Program.

Opportunities for restoration include creating sustainable aquatic habitat and native fishery for Tingley Ponds. Adjacent to the Tingley Ponds lies an opportunity to restore the riparian community next to the Rio Grande. Water is available to create wetland communities in the riparian area adjacent to the Tingley Ponds. Other riparian restoration opportunities include, jetty jack removal, exotic/invasive species removal, native plant establishment and enhancing hydrology in the bosque. Other opportunities include increasing the educational experience for visitors to the Biological Park area.

1.4 REGULATORY COMPLIANCE

This document was prepared by the Corps, Albuquerque District, in compliance with all applicable Federal statues, regulation, and Executive Orders, including;

- National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq*.);
- Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 *et seq*.);
- U.S. Army Corps of Engineers' Procedures for Implementing NEPA (33 CFR 230);
- Clean Air Act, as amended (42 U.S.C. 1251 *et seq*.);
- Clean Water Act Section 404 of 1977, as amended (33 U.S.C.§ 1344 *et seq*.);

- Endangered Species Act, as amended (16 U.S.C. 1531 *et seq*.);
- Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*.);
- Floodplain Management (Executive Order 11988);
- Protection of Wetlands (Executive Order 11990);
- Federal Noxious Weed Act (7 U.S.C. 2801-2814 *et seq*.)
- Section 106 of the National Historic Preservation Act, as amended (16 U.S.C. 470 et seq.);
- Protection of Historic and Cultural Properties (36 CFR 800 et seq.);
- Protection and Enhancement of the Cultural Environment (Executive Order 11593);
- American Indian Religious Freedom Act (42 U.S.C. 1996); and
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.).

This DPR/EA is also in compliance with applicable State of New Mexico and City of Albuquerque regulations and standards.

SECTION 2 EXISTING ENVIRONMENTAL SETTING

2.1 PROJECT AREA LOCATION

The general project area is located in the City of Albuquerque, Bernalillo County, New Mexico (see Figure 2.1-1). Tingley Ponds are located on the east side of the Rio Grande immediately south of Central Avenue. Central Avenue is also known as the Historic Route 66 traversing through the City of Albuquerque. The riparian area or bosque west of the ponds is where the proposed wetlands creation and riparian restoration are proposed. Located east of the project area include the Albuquerque Country Club Golf Course and the Albuquerque Biological Park.

2.2 PERTINENT WATER RESOURCE DEVELOPMENT PROJECTS

The following flood control projects have altered the sediment regime, hydrograph and high peak flows of the Rio Grande through upstream impoundments, levees and jetty jacks. These measures have largely eliminated the element of disturbance providing the cyclic regeneration and diversity of riparian and wetland plant communities.

Figure 2.1-1 Location of the Project Area in Albuquerque, New Mexico; adapted from USGS Digital Ortho Quarter Quadrangle Image: Albuquerque West, New Mexico (35106-A6-2, Data Flown 1996-98; NAD83, UTM Zone 13), Not to Scale

Flood Control Act of 1948

In 1943, the Corps and the Bureau of Reclamation (BOR) began a cooperative study, which considered the lack of adequate flood control within the Middle Rio Grande Valley. The results of this study were reported in the Rio Grande Comprehensive Plan and led to the authorization of the Food Control Act of 1948. The Act tasked the Corps with the construction of flood control reservoirs and rehabilitating, modifying, and extending the levee system constructed by the MRGCD between 1930 and 1936.

In addition, the BOR was responsible for clearing a floodway and installing jetty fields (i.e. Kellner jetty jacks) to establish and confine the river to a stable channel. Jetty jacks perform this function by obstructively reducing the water flow velocities and thus causing the suspended sediments to settle-out of the water column. The cumulative depositional process eventually forms a well-defined channel by raising the relative elevation of the floodway. Consequently, the channel has an increased conveyance capacity that resists the natural tendency to meander (Corps, 2003).

Cochiti Dam

The Cochiti Dam and Lake Project is located on the mainstem of the Rio Grande, about 50 miles upstream from Albuquerque. The dam spans both the Rio Grande and the Santa Fe River near their confluence. The Flood Control Act of 1960 (P.L. 86-645) authorized the construction of Cochiti Dam for flood and sediment control. In 1964, P.L. 88-293 authorized the establishment of a permanent pool for the conservation and development of fish and wildlife resources and recreation purposes. Construction of Cochiti Dam began in 1965 and was put into operation in 1975. Reservoir releases are restricted to the maximum non-damaging capacity of the downstream channel as measured at Albuquerque, approximately 7,000 cfs (Corps, 1996). When inflow would exceed the channel capacity of the Rio Grande downstream, storage in initiated. Floodwaters are stored only for the duration required and are evacuated as rapidly as downstream conditions permit.

Flood storage is normally associated with snowmelt runoff during April through June. Summer flood storage is generally the result of short-term, high intensity thunderstorm events. The maximum water storage to date has been 396,167 acre-feet (water surface elevation 5,434.5 feet), which occurred in 1987. This volume included the permanent pool and flood control storage pools.

Jemez Canyon Dam

The Jemez Canyon Dam and Reservoir Project is located on the Jemez River approximately 2.8 miles upstream from its confluence with the Rio Grande. It is situated in Sandoval County, about 5 miles northwest of Bernalillo, New Mexico, and about 22 miles north of Albuquerque. The Jemez River enters the Rio Grande about 25 miles downstream from Cochiti Dam.

Congressional authority for the construction of Jemez Canyon Dam is contained in the Flood Control Acts of 1948 (P.L. 80-858) and 1950 (P.L. 81-516). The facility regulates Jemez River flows for flood damage reduction and sediment management. Construction of the dam began in May 1950, and it was completed and placed into operation in October 1953.

Flood storage is normally associated with snowmelt runoff during April through June. Summer flood storage is generally the result of short-term, high intensity thunderstorm events. The maximum water storage to date has been 72,254 acre-feet (water surface elevation 5,434.5 feet), which occurred in 1987. From closure in 1955 through 1998, Jemez Canyon Reservoir has retained approximately 19,800 acre-feet of sediment..

2.3 PHYSIOGRAPHY AND GEOLOGY

The Middle Rio Grande lies within the Basin and Range and Southern Rocky Mountain physiographic provinces. The project area lies within the Rio Grande Rift Valley, which extends more than 500 miles from central Colorado through New Mexico (Crawford et al., 1993). The Albuquerque Biopark Wetland Creation Project is located in the Middle Rio Grande subsection of the Basin and Range Physiographic Province (Williams, 1986). The headwaters of the Rio Grande are in the San Juan Mountains of southern Colorado. The river flows south from Colorado through the length of New Mexico and then forms the international boundary between Texas and Mexico along its 2,000 mile route to the Gulf of Mexico. The Rio Grande drains approximately 181,000 square miles of land (Bullard and Wells, 1992).

The major landforms of the Middle Rio Grande Valley are the result of the area's dominant geologic feature, the deep, sediment-filled Rio Grande Rift. This reach of the Rio Grande is bounded on the east and west by raised landforms and mountains. The valley has a deep trough filled with sand, clay, silt, gravel, and cobble by the extension and fracture of the Earth's crust, this physiographic feature is generally bounded by fault-block uplifted mountains (Kelley, 1977). The crust extension/mountain-building processes form a corresponding depression in the overall topography in which the Rio Grande flows. The Middle Rio Grande valley is generally; narrow, ranging from less than a mile in narrow or incised canyons to about 6 miles in other parts. The Rio Grande is situated in an alluvial valley developed in the rift-fill sediments of the Santa Fe Group (Bullard and Wells, 1992).

2.4 SOILS

The soil series in the Tingley Pond and wetland project area includes the Vinton and Brazito soils. These soils are occasionally flooded and are found inside of the levee next to the Rio Grande. The soils are somewhat stabilized by vegetation. The Vinton surface layer ranges from sand to clay. The Brazito surface layer ranges from sand to clay and is dominantly sand, loamy sand, and sandy loam. Runoff and water erosion are slight except during periods of flooding. Permeability is moderately rapid and the seasonal water table is generally encountered within five feet from the surface (USDA, 1977). Soils along the existing pond belong to the Vinton Series and are described as Vinton and Brazito soils which are occasionally flooded. The soils are moderately alkali to strongly alkali and have a seasonal water table above a depth of 60 inches.

The Corps Albuquerque District, collected soil substrate data on 16 May 2000. Soil borings varying in depth from three to six feet were taken at twelve sites close to the proposed wetland. Soils, in the project area, vary from fine to coarse sand, typical of a fluvial floodplain with a wide, meandering river pattern such as the Rio Grande.

An electromagnetic induction survey was performed on the soils in the wetland project area in April of 2002. Apparent soil electrical conductivity is well below the threshold value of 60MS/m for cottonwood trees. Soil salinity does not pose any limitation on the restoration of this portion of the bosque (Hendrickx, 2002).

2.5 CLIMATE

Climate of the project area is characterized as arid continental – hot summers with an important diurnal range in temperature (65-96°F). Winters vary from moderate in the lower basin to severe in the adjacent mountainous area. The spring and fall transition seasons are usually short. Thunderstorms are most active during July and August and usually reach peak activity in late afternoon. Change from summer to winter is characterized by the disappearance of thunderstorm activity followed by clear weather, which dominates between winter frontal passages. The average growing season is about 165 days (NRCS, 1999).

Mean annual precipitation at Albuquerque Airport is 8.70 inches; mean monthly precipitation is given in Table 2.5-1. About one-third of the annual precipitation occurs during July and August as thunderstorms.

TABLE 2.5-1. MONTHLY TEMPERATURE, PRECIPITATION, AND EVAPORATION AT ALBUQUERQUE AIRPORT, NEW MEXICO.

Month	Average daily minimum temp. (°F)	Average daily maximum temp. (°F)	Average Total Precipitation (inches)
January	23	47	0.37
February	28	53	0.38
March	33	61	0.51
April	41	70	0.51
May	50	79	0.66
June	59	89	0.64
July	65	92	1.36
August	69	89	1.49
September	56	82	0.95
October	44	71	0.90
November	31	57	0.44
December	24	48	0.48
Annual	43	70	8.70

Data from NRCS (2001).

2.6 HYDROLOGY

Hydrology in the Albuquerque Reach of the Rio Grande follows a pattern of high flows during spring snowmelt runoff and low flows during the fall and winter months. Additional, short duration, high flows result from thunderstorms that occur in late summer months. This portion of the Rio Grande hydrology has been altered due to the influence of flood control dams such as Cochiti and Jemez Canyon Dams. Cochiti Dam primarily acts to decrease peak flows and has a much smaller impact on low flows; therefore, average annual flows have been less affected, while peak flows have been reduced. Average yearly hydrographs for pre- and post-Cochiti Dam periods are shown in Figure 2.6-1. The annual hydrographs show that the influence of Cochiti Dam has been to reduce the peak flows and extend the duration of the high flow period. Average winter base flows are somewhat larger during the post-dam period.

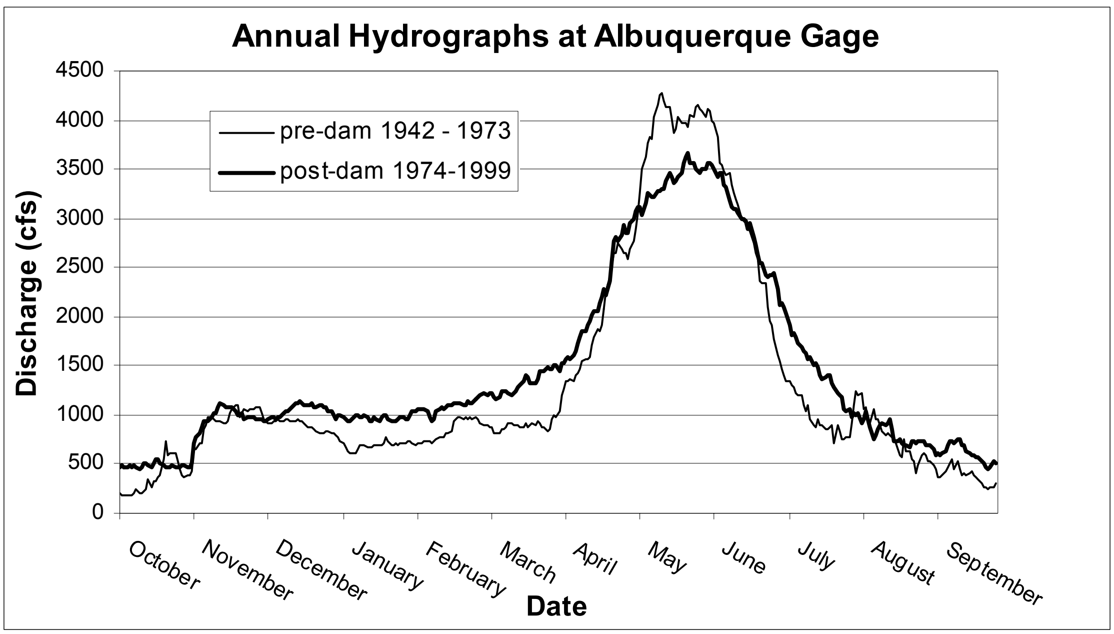


Figure 2.6-1. Average annual hydrograph at Albuquerque gaging station for pre- and post-Cochiti Dam periods. (USGS, 2003)

Review of annual peak series data also exhibits the influence of flood control. Historical annual peak discharges recorded at the Albuquerque gage illustrate the effects of regulation on the Rio Grande (Figure 2.6-2). From 1927 to 1945 floods in excess of 20,000 cubic feet per second (cfs) were experienced approximately every five years. From 1945 to the construction of Cochiti Dam in 1973, floods in excess of 10,000 cfs were fairly common with the exception of drought years. Following construction of Cochiti Dam, regulation has prevented flows from exceeding 10,000 cfs. This has reduced the average annual peak discharge from 9,800 cfs to 5,700 cfs. A study to determine the effects of regulation on Middle Rio Grande flood hydrology was performed by the U.S. Bureau of Reclamation Flood Hydrology Group (Bullard and Lane, 1993). This study estimated return period floods at ten USGS gaging stations on the Middle Rio

Grande. The study applied a procedure to develop discharge values for regulated (dam) and unregulated (no-dam) conditions. Flood control dams have acted to reduce flood flows by approximately a factor of two. This is significant with respect to geomorphology since channel-forming processes are assumed to be dominated by discharges within the range of these recurrence intervals.

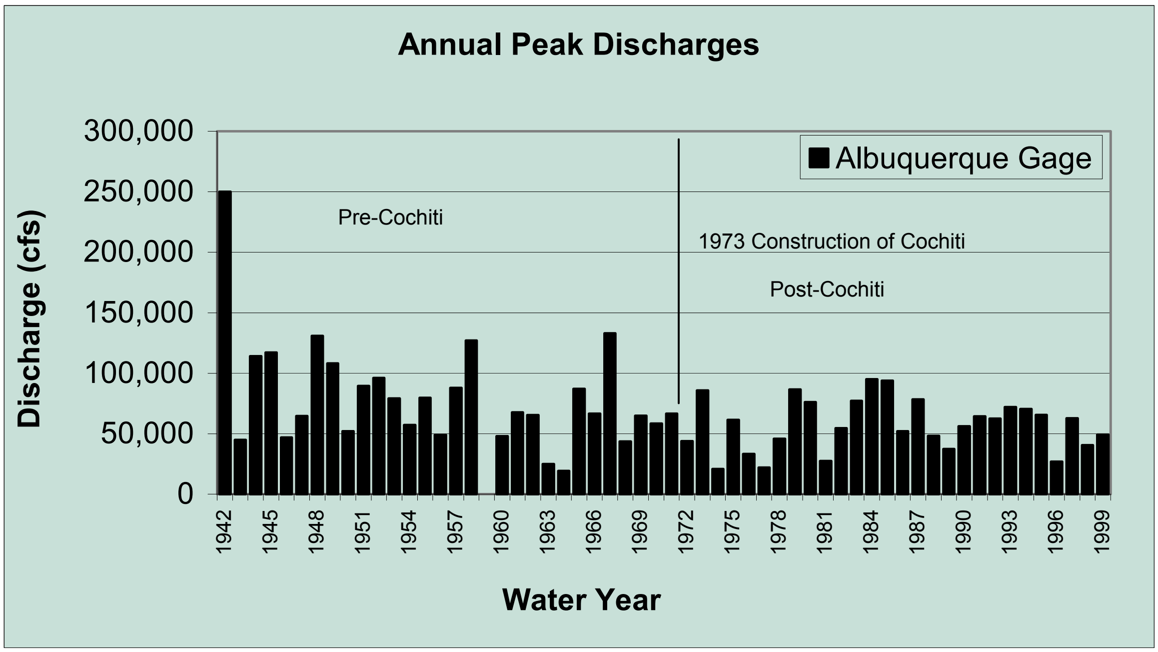


Figure 2.6-2. Annual Peak Discharges at the Albuquerque Gage.

2.7 GEOMORPHOLOGY

The Rio Grande in the Albuquerque area is predominately a sandbed river with low, sandy banks. There are numerous sandbars and the river channel tends to be straight due to jetty jack fields and levee placement (Crawford et al. 1993). The Rio Grande through Albuquerque is typified by a uniform channel width averaging 597 ± 98 feet. The slope of the river is less than 0.01 (Tashjian, 1999).

2.8 WATER QUALITY

In the summer of 2000, water quality measurements were collected by the Corps in the project area. Other agencies, including the New Mexico Department of Game and Fish (NMDGF) and the City of Albuquerque have monitored water quality at the ponds. Water quality at the Tingley Ponds fluctuates throughout the year depending on the rate at which fresh groundwater is introduced to the system. Little vertical stratification of water quality related to temperature and total dissolved solids measurements is noticed in the Tingley Ponds.

The City well water used to fill and maintain Tingley Pond is rich in nutrients, which can cause eutrophication problems. Eutrophication is water pollution caused by the introduction of excessive plant nutrients such as phosphorous, nitrogen and carbon. Heavy growths of aquatic vegetation or eutrophication and nuisance blooms of algae have been observed in other aquatic systems when nitrate concentrations exceed 0.5 mg/l and total phosphates exceed 0.03 mg/l. Water samples indicated phosphates were 0.05 and 0.07 mg/l respectively, while nitrates were <0.5 mg/l and nitrites were 0.71 mg/l. The excessive growth, or blooms of algae promoted by these phosphates changed water quality in Tingley Pond by reducing the amount of dissolve oxygen in the ponds. This oxygen depletion has resulted in fish kills and outbreaks of avian botulism (City of Albuquerque, 1991).

Avian botulism outbreaks have occurred in the Tingley Ponds for several decades, which is a form of waterfowl food poisoning that occurs in wetlands throughout the world. The toxin affects the nervous system by preventing impulse transmission to muscles, which results in paralysis. Consequently, birds are unable to use their wings and legs normally or control the third eyelid, neck muscles, and other muscles. Birds with paralyzed neck muscles cannot hold their heads up and often drown. Death can also result from water deprivation, electrolyte imbalance, or respiratory failure. A toxin produced by a virus that infects spores of the bacterium *Clostridium botulinum* causes avian botulism. The spores are common in sediments that underlay many waterbodies; however, the toxin is not produced until infected spores grow in the presence of high temperatures, lack of oxygen, and decaying organic matter (Friend et al., 1995).

Groundwater quality measurements in the proposed wetland area are relatively stable and are indicative of a groundwater system adjacent to a river system.

Section 402(p) of the Clean Water Act (CWA) 1972, as amended, specifies that stormwater discharge associated with construction activities disturbing one or more total acres of land must be authorized by a National Pollutant Discharge Elimination System Permit. Prior to the start of construction, a Storm Water Pollution Prevention Plan must be prepared by the Federal Government or the construction contractor and a Notice of Intent be filed with Region 6 of the Environmental Protection Agency (EPA). Appropriate Best Management Practices (BMPs) would be used as necessary to prevent erosion and sedimentation wherever project construction activities occur.

Section 404 of the CWA provides for the protection of wetlands and waters of the U.S. from impacts associated with discharges of dredged or fill material. The Rio Grande is a jurisdictional water of the United States and is immediately adjacent to the proposed wetland creation site. The ponds are not considered jurisdictional waters of the United States at this time due to the artificial water supply and their isolation from the Rio Grande. The riparian zone adjacent to the east bank of the Rio Grande downstream of Central Avenue is not a jurisdictional wetland since hydric soils and wetland hydrology are absent (Manger, 2001). Therefore, the proposed project does not include any discharges of dredged or fill material into waters of the United States.

2.9 AIR QUALITY AND NOISE

The evaluation area for this resource category is located in Bernalillo County. The proposed project site is located in the New Mexico intrastate Region 2 (EPA Region 152) for air quality monitoring. EPA has designated the air quality within all of Bernalillo County as better than

National Ambient Air Quality Standards for sulfur dioxide and nitrous oxide (i.e., an attainment area), and unclassified for carbon monoxide, lead and ozone. Bernalillo County is designated as an attainment area for particulate matter.

In addition to the Federal standards, airborne particulate matter in the City and Bernalillo County area is regulated under New Mexico (1997) regulations for Airborne Particulate Matter, Title 20, Chapter 11, Part 20 of the New Mexico Administrative Code (20 NMAC 11.20). Local permitting and regulatory enforcement by the City's Department of Environmental Health are based on these state regulations. New Mexico also has a regulation for Smoke and Visible Emissions (Air Quality Regulation 401), which limits open-air emissions of 30-percent opacity or greater from mobile equipment to 10 seconds duration or less at elevations below 8,000 feet above mean sea level.

The existing noise conditions of the project area include undeveloped open space and recreation area that typically experience relative low-level ambient noise backgrounds. Central Avenue and Tingley Drive do however contribute to the ambient noise levels (City of Albuquerque, 1994).

2.10 ECOLOGICAL SETTING

Tingley Ponds Vegetation

The majority of the plants at Tingley Ponds are exotic or not native to North America. The area surrounding the ponds is dominated by bare ground and Siberian elm (*Ulmus pumila*). Other woody species in the pond area include tree-of-heaven (*Ailanthus altissima*), salt cedar (*Tamarix* sp.) and Russian olive (*Elaeagnus angustifolia*). Annual herbaceous plants and coyote willow (*Salix exigua*) were associated with the bank of the pond. Russian thistle (*Salsola kali*) and a few composite species occurred away from the water's edge.

Riparian Vegetation

The vegetation associated with the proposed wetland creation location is dominated by woody riparian vegetation. Dominant woody plants include: native cottonwoods (*Populus fremontii*) in the overstory, and Russian olive (*Eleagnus angustifolia*), white mulberry (*Morus alba*), and tree-of-heaven (*Ailanthus altissima*) in the understory. These understory species are exotic or not native to the bosque. Woody plant density increases from east to west (levee to river) (Ecosystem Management Inc., 2001). Fallen dead trees and shrubs also litter the understory, which creates a fire hazard.

Historical accounts of wetlands in the form of small lakes, marshes, and meadows were a significant component of the floodplain biological community. Wetlands consist of marshes, wet meadows, and seasonal ponds that typically support hydrophytic plants such as cattails, sedges and rushes. Wet meadows were the most extensive habitat type in Middle Rio Grande valley prior to the construction of the MRGCD drains and ditches. From 1918 to present, wetland-associated habitats have undergone a 93% reduction (Hink and Ohmart, 1984; Scurlock, 1998). Wetlands are an integral component of the bosque ecosystem, not only increasing its diversity but also enhancing the value of surrounding plant communities for wildlife. Wetlands have experienced the greatest historical decline of any floodplain plant community. Among the greatest needs of the riparian ecosystem are the preservation of existing wetlands and expansion or creation of additional wetlands (Crawford et al., 1993). The best example of wetlands in the Albuquerque area is the San Antonio Oxbow on the west side of the Rio Grande.

Noxious Weeds and Invasive Species

The Federal Noxious Weed Act of 1974 (P.L. 93-629; 7 U.S.C. 2801) provides for the control and eradication of noxious weeds and their regulation in interstate and foreign commerce. Executive Order 13112 directs Federal agencies to prevent the introduction of invasive (exotic) species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

In addition, the State of New Mexico, under administration of the United States Department of Agriculture, designates and lists certain weed species as being noxious. “Noxious” in this context means plants not native to New Mexico that have a negative impact in the economy or environment, and are targeted for management or control. Class C listed weeds are common, widespread species that are fairly well established within the state. Management and suppression of Class C weeds is at the discretion of the lead agency. Class B weeds are considered common within certain regions of the state but are not widespread. Control objectives for Class B weeds are to prevent new infestations, and in areas where they are already abundant, to contain the infestations and prevent their further spread. Class A weeds have limited distributions within the state. Preventing new infestations and eliminating existing infestations is the priority for Class A weeds.

Three species identified as Class C weeds occur in both project areas include: salt cedar, Russian olive and Siberian elm occur in the project area (Rice, 2003). These species comprise approximately 50% of the total density of both project areas.

Fish

The existing Tingley Pond area is an important aquatic resource due in large part to its uniqueness within the region. Tingley Pond is one of the most heavily fished areas in New Mexico, and the NMDGF maintains a “put and take” fishery in the lake. It is classified by the NMDGF as a summer catfish and winter trout water. Hatchery reared rainbow trout are released between November 1 and March 31. Summer catfish are stocked during May, June and July. Current plants are approximately 2,000 16-inch catfish per year and 19,000 10-inch rainbow trout per year. Currently, the rainbow trout fishery is limited too the winter months due to high water temperatures and low dissolved oxygen in the summer months (NMDGF, 2002a).

No aquatic habitat (i.e. surface water) currently exists in the location of the proposed wetlands area. This area is dominated by riparian vegetation (see above discussion of Riparian Vegetation).

Wildlife

An urban setting exists around Tingley Ponds. The ponds support a limited amount of wildlife, with domestic waterfowl and resident Canada Geese using the area.

Wildlife species within and in the wetland project area are typical for Middle Rio Grande Valley. Neotropical migrants and resident avian species frequent the area and live within the bosque. These species include: Coopers Hawk (*Accipiter cooperii*), Great-Horned Owl (*Bubo virginianus*), Greater Roadrunner (*Geococcyx californianus*), Downy Woodpecker (*Picoides pubescens*), American Crow (*Corvus brachyrhynchos*), American Kestrel (*Falco sparverius*), House Finch (*Carpodacus mexicanus*), American Robin (*Turdus migratorius*), Green Heron (*Butorides* virescens), Black-Chinned Hummingbird (*Archilochus alexandri*), Canada Goose (*Branta canadensis*), and various species of waterfowl. In addition, various other animals inhabit the area such as mice, rabbits, skunks, coyote, beaver, and lizards.

2.11 ENDANGERED AND PROTECTED SPECIES

A list of Federally listed endangered, threatened and candidate species and species of concern for Bernalillo County, was obtained (USFWS, 2002). Federally listed species are shown in Table 2.11-1.

TABLE 2.11-1. FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

Federally Listed Species	Federal Status [a/]	Habitat
Bald eagle *Haliaeetus leucocephalus*	T	Rivers, reservoirs with large trees or cliffs near the water.
Black-footed ferret *Mustela nigripes*	E	Grassland plains surrounding mountain basins to 10,500 ft elevation. Usually found in association with prairie dogs, which serve as their primary food source and provide the ferrets with abandoned burrows for shelter.
Mexican spotted owl *Strix occidentalis lucida*	T	Mature montane forest and woodland, shady wooded canyons, and steep canyons.
Mountain plover *Charadrius montanus*	PT	Arid shortgrass prairie, which is dominated by blue grama and buffalo grass with scattered clumps of cacti and forbs.
Rio Grande silvery minnow *Hybognathus amarus*	E	Found in main channel habitat with low to moderate water velocities over silt, sand, or gravel bottom.
Southwestern willow flycatcher *Empidonax trailli extimus*	E	Riparian areas along streams, rivers, and other wetlands where dense willow, cottonwood, buttonbush, and arrowweed are present.
Western yellow-billed cuckoo *Cocyccus americanus*	C	Riparian areas along streamside forests, especially those dominated by willow and cottonwood stands.

Federally Listed Species	Federal Status a/	Habitat
Whooping crane *Grus americana*	E (XN)	Marshes, shallow river bottoms, potholes, prairies and cropland.

a/ C= Candidate, T = Threatened, E = Endangered, PT = Proposed Threatened, XN = Experimental Nonessential Population

Specialized habitat requirements such as vegetation type and cover, elevation and geographic location for the species listed above comprise the preferred habitat regimes for these flora and fauna. Three of the eight Federally listed species may occur in the project area and are discussed in detail below. These include the Rio Grande silvery minnow, Southwestern Willow Flycatcher, and Bald Eagle. The remaining 5 species are unlikely to occur due to the lack of suitable habitat, and therefore are not discussed any further.

Rio Grande Silvery Minnow

The Rio Grande silvery minnow (*Hybognathus amarus*) was listed as endangered on July 20, 1994 by the USFWS (USFWS, 1994). Critical habitat has been designated for the Rio Grande from Cochiti Dam to the headwaters of Elephant Butte Dam and the lower Jemez River. The critical habitat designation defines the lateral extent (width) as those areas bounded by existing levees. In areas without levees, the lateral extent of critical habitat is proposed to be defined as 300 feet of riparian zone adjacent to each side of the river.

The project area (specifically the wetland project area) is located within designated critical habitat for the Rio Grande silvery minnow. The critical habitat is defined as the lateral extent (width) as those areas bounded by existing levees of riparian zone adjacent to each side of the bankfull stage of the middle Rio Grande (USFWS, 2003).

In January and February of 2002, 13 and 3, respectively, Rio Grande silvery minnows were collected at Central Avenue Bridge. One minnow was collected in August and one in October of 2002 at Central Bridge. Four minnows were collected in December of 2002 at Central Avenue Bridge (BOR, 2002a). Monitoring occurred throughout the year, however, minnows were only collected for the months noted above.

Southwestern Willow Flycatcher

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) was listed as endangered on February 27, 1995 (USFWS, 1995a) and critical habitat was designated on July 22, 1997 (USFWS, 1997). No critical habitat has been designated for the Southwestern Willow Flycatcher in the Rio Grande Basin.

Southwestern Willow Flycatchers breed in dense riparian habitats along rivers, streams, or other wetlands. Vegetation can be dominated by dense growth of willows, seepwillow or other shrubs. Almost all Southwestern Willow Flycatcher breeding habitats are within close proximity (less than 20 yards) of water or very saturated soil. The project area itself does not contain any flycatcher habitat. Potential Southwestern Willow Flycatcher habitat occurs on a sidebar (known as the Zoo Sidebar) in the river channel, which is adjacent to the project area.

As of the 1999 breeding season, the approximate confirmed numbers of flycatchers was just over 900 territories. In New Mexico, the species has been observed in the Rio Grande, Rio Chama, Zuni, San Francisco and Gila River drainages. Surveys for willow flycatchers in the Greater Albuquerque Metropolitan area were conducted at Interstate 40, Central Avenue, and Montaño Bridges; Tingley Beach; Zoo Sidebar; and Calabacillas Islands in 1995 and 1996 by BOR and the USFWS. No flycatchers were detected during these surveys (Cooper, 1996 and 1997).

In 2000 and 2003, a survey for flycatchers was conducted at the Zoo Sidebar. No flycatchers were detected during these surveys (Howell, 2000 and Corps, 2003).

Bald Eagle

In 1978, in response to lowering population and reproductive success, the USFWS (1978) listed the Bald Eagle (*Haliaeetus leucocephalus*) throughout the lower 48 states as endangered except Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened. On August 11, 1995, USFWS reclassified the bald eagle from endangered to threatened (USFWS, 1995b).

Midwinter surveys conducted annually by the NMDGF show that the number of bald eagles wintering in New Mexico have steadily increased since the late 1970s, from an annual average of 220 birds then to 450 by the mid-1990s. Only three pairs of bald eagles nested in the state in each year 1999 –2001 (NMDGF, 2002b).

Bald eagles have been reported in and around the City of Albuquerque, usually in areas away from the center of the City (e.g. above Alameda Boulevard Bridge or below the Rio Bravo Bridge) (Stahlecker and Cox, 1997). However, eagles roost and reside along the river during the winter. The Christmas Bird Count (CBC) conducted on December 17, 2000 in Albuquerque noted nine adult and one immature Bald Eagles (Birdsource, 2001). This is an increase from previous CBCs, which recorded 6 Bald Eagles in 1997, 5 in 1998, and 6 in 1999 (these numbers are the totals of adults and immatures) (Birdsource, 2001). The CBC conducted on December 15, 2001 noted 7 adult and 4 immature Bald Eagles in Albuquerque (Birdsource, 2002).

2.12 CULTURAL RESOURCES

Culture History

The culture history of the Southwest and the project area has been chronologically generalized into several classification schemes that utilize noticeable changes in the cultural record, as seen in temporal and spatial similarities and differences, to assist in the explanation and interpretation of the cultural record. The primary Periods and their approximate dates are as follows:

PaleoIndian	ca. 11,500 B.P.- 7,500 B.P.
Archaic	ca. 7,500 B.P. – 2,000 B.P.
Puebloan	ca. 1 - 1540
Historic	1540 - Present.

These Periods are further subdivided to describe specific regional and local variations in the archaeological record (Cordell, 1997, 1984, 1979; Stuart and Gauthier, 1984; and Simmons et al. 1989).

The earliest cultural time periods represented in the archaeological record are the PaleoIndian and Archaic Periods that are typically identified by the presence of morphologically diagnostic projectile points. Judge (1973) has provided evidence for PaleoIndian Period human use of the central Rio Grande Valley. In New Mexico, the chronology defined by Cynthia Irwin-Williams (1973) for the Arroyo Cuervo region in northwestern New Mexico has been the most widely utilized for the Archaic Period although Huckell (1996) has recently brought together documentation for the period in the Southwest. The end of the Archaic Period is difficult to define chronologically because the mobile hunting and gathering lifestyle continued in many areas into the Historic Period.

The Historic Period in the Southwest is initiated with the 1540 entrada of the Spanish and the Spanish provided the first written descriptions of the Rio Grande Valley and it's inhabitants. In 1598, Oñate arrived in the Rio Grande Valley, claiming the region for Spain and began his colonization efforts. Oñate's Rio Grande route, upon gaining some permanence became known as the El Camino Real de Tierra Adentro, the Royal Road, and provided the major link for numerous travelers, traders, and provincial supply caravans between Nuevo Mexico and other cities in Mexico (U.S. Department of Interior, 1996; and Boyle, 1994). Much later, Americans would also use the route to extend the Santa Fe Trail trade (1820-1880) down the Camino Real/Chihuahua Trail into Mexico making the route an international-trade network (Boyle, 1994). The Camino Real route passed through Albuquerque communities.

Flooding in the valley has been a major problem from the time that humans started utilizing the floodplain for more intensive human activities such as agriculture. For centuries the Puebloan peoples and then the Spaniards modified the floodplain for agricultural activities and temporarily retreated many times from rising flood water.

In `925, the MRGCD was organized under the State's 1923 Conservancy Act to deal with the severe flooding, waterlogged lands, and failing irrigation facilities (Ackerly et al., 1997; Scurlock, 1998; Wozniak, 1987; and Biebel, 1986). By 1928, a reclamation, flood control, and irrigation plan was developed and between 1930 and 1934 major portions of the plan, including flood control levees, riverside drainage canals, and irrigation ditches and diversions, were constructed by the MRGCD (Ackerly et al. 1997; Scurlock 1998; Wozniak, 1987; and Berry and Lewis, 1997). The new facilities were to provide for the efficient delivery of irrigation water, prevent flood hazards and provide flood protection measures, regulate the Rio Grande channel and stream flows and provide drains to reclaim land that had become saturated and saline from high groundwater levels (Ackerly et al., 1997).

Taking advantage of the natural opportunity that required only a small expense, Albuquerque's influential Mayor Tingley convinced the MRGCD to shape the area for recreational use (see photographs in Biebel [1986] and those available at the Albuquerque Museum). In honor of MRGCD's assistance, Conservancy Park was dedicated on August 9, 1931 (Polk *et al*., 1999:8). For numerous years, the Park has also been known as Tingley Beach. Additional Civil Works Administration funds were utilized in November of 1933 to widen the levee along Conservancy Beach (Biebel, 1986:30). The early 1930s also saw the realignment of

U.S. Highway 66 to a more east-west route through Albuquerque with a new Old Town Bridge being constructed across the Rio Grande immediately upstream of Tingley Beach (Polk *et al*., 1999; Biebel, 1986). In 1936, the City raised matching funds for another WPA allotment for "…widening, raising, and surfacing Tingley Drive from the Old Town Bridge to the Barealas Bridge" (Biebel, 1986).

In the spring of 1941, severe flooding affected the mid-section of the Rio Grande where it flooded almost nonstop for two months, breaching and overtopping the levee system in many areas (Crawford et al., 1993:26; and Welsh, 1985:110). The flooding helped the passage of the Flood Control Act of 1941 in which Clinton P. Anderson, New Mexico's State Representative, inserted a clause requiring the Corps and BOR to develop a joint-use plan for the Rio Grande near Albuquerque. By 1948, Federal agencies as well as the Rio Grande Compact commissioners from New Mexico, Colorado, and Texas, had worked extensively on House Document No. 243 (81st Congress, 1st session; Welsh 1985). The Flood Control Act of 1948 authorized several projects in New Mexico and called for a comprehensive plan for the Rio Grande, and recommended other projects "…to control the heavy sedimentation of the river, and to upgrade the present irrigation systems to gain efficiency" (Crawford et al., 1993; Welsh 1985; and Ackerly et al., 1997). At about the same time, a "…memorandum of agreement [was] signed between the Interior secretary and the Chief of Engineers on 25 July 1947" that "…delineated the areas of responsibility for the Corps and Reclamation in the Rio Grande basin" (Welsh, 1985; and Wozniak, 1987).

By 1950, "The levees built with MRGCD money suffered from extensive erosion" (Welsh, 1985). Starting in 1951 the Corps and the BOR began a comprehensive Rio Grande Floodway project, authorized in 1950, that constructed and rehabilitated flood control levees and installed thousands of Kellner jetty-jacks to armor the river banks and maintain the Floodway (Crawford et al., 1993; Ackerly et al. 1997; Welsh 1985; and Scurlock 1998). The major channel modification project to maintain channel capacity was completed by the Bureau in 1959 and "The Corps of Engineers reconstructed the levee-riverside drains in the Albuquerque area in 1958" with most of the Corps and Reclamation work being completed between 1962 and 1964 (Ackerly et al., 1997; Scurlock, 1998; and Crawford et al., 1993).

These years of human influence on the floodplain in the Albuquerque area have resulted in a reshaped and restricted Rio Grande channel that has been significantly altered with the use of heavy equipment. Subsequent to this work, significant sediment deposition has occurred within the jetty-jack fields of the restricted floodplain now contained between the engineered flood control levees. Today, sediment deposition in these over-bank areas of the confined floodplain in the project area averages between two and five feet in depth.

2.13 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The socioeconomic assessment identifies major social and economic benefits and costs of the proposed action construction and operation. The project area is located entirely within Bernalillo County. In 2000, Bernalillo County had a median household income of $38,788, with the annual average salary of $29,672 (U.S. Census, 2000). There are no businesses located near the project area that would be affected by construction or operation of the Proposed Project.

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations; February 11, 1994) provides minority and low-income populations an opportunity to comment on the development and design of Federal activities and on the consequences of proposed Federal actions. This Executive Order requires that Federal agencies shall make achieving environmental justice part of their missions by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations.

Within a half of a mile the project area is composed of a mixture of income levels. Field investigations of the areas to be affected by the construction activities did not reveal the presence of community characteristics that would be considered disproportionately minority or low-income neighborhoods.

2.14 LAND USE AND RECREATIONAL RESOURCES

Land use in the Tingley Pond project area is mainly urban and recreational. The City of Albuquerque holds fee simple title to the Tingley Pond and all lands in the project area east of the levee. Activities at the Tingley ponds include fishing and some limited picnicking.

The dominant land use in the vicinity of the project is different types of residential units from single family units to apartment buildings. The Huning Castle Addition is a predominantly residential community separated by Kit Carson Park and the MRGCD riverside drain. The Barelas neighborhood is situated to the east and south of the site (City of Albuquerque, 1991).

The proposed wetland creation area is located in the Rio Grande Valley State Park (RGVSP), which is managed, by the City of Albuquerque Parks and Recreation Department Open Space Division. The MRGCD holds fee simple title to the proposed wetland and bosque restoration areas. The park is 22 miles in length and includes approximately 5,000 acres of bosque and river. Management of the RGVSP is to conserve, protect, enhance and diversify existing ecosystems (City of Albuquerque, 1987). Land uses in this area include riparian and wildlife habitat and recreation. Recreational opportunities in the wetland project area include hiking and bird and other wildlife observation. The creation of wetlands in this area of the RGVSP is identified as a goal and policy of the Bosque Action Plan (City of Albuquerque, 1993).

2.15 HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE

The proposed area was examined during a walk-through, by the Corps employee, on June 26, 2000. No areas with potential hazardous, toxic, and radiological waste (HTRW) impacts were identified. A data search for known Leaking Underground Storage Tanks and landfill sites was queried on the City of Albuquerque Health Department’s website (www.cabq.gov/gis/equity.htm). The closest LUST was identified outside of the project area at the intersection of Central Avenue and New York which is approximately 0.3 of a mile northeast of the project area (City of Albuquerque, 2001). Small amounts of residential and construction debris were noted in the project area.

2.16 AESTHETICS

Aesthetics include the presence and appearance of landforms, water surfaces, vegetation and human created features relative to the surroundings and settings of the area. These features are primary characteristics of an area or project that determine visual character and the manner in which people view the setting. Existing visual character in the project evaluation area consists of two distinctly different settings.

Aesthetics of the Tingley Pond area would be considered low. Bare ground is the dominant feature as well as debris and household garbage floating in and surrounding the ponds. Aesthetics in the bosque area would be considered high. The riparian area is dominated by large cottonwood trees with exotic dominated woody plant understory.

SECTION 3 FUTURE CONDITIONS WITHOUT PROJECT

Future conditions without project implementation were projected to characterize the "no action" alternative and its effects, and to form a basis for comparison of restoration benefits. The following summarizes future conditions for pertinent (*i.e.*, hydrologic, geomorphic, and ecologic) resources.

3.1 HYDROLOGY AND GEOMORPHOLOGY

Overbank flooding would likely not occur in the project area due to increased channel degradation and regulated low flows. Prior to the Flood Control Projects (noted in Section 2.2), overbank flooding contributed to the creation and persistence of native riparian and wetland communities known to occur in the Middle Rio Grande Valley. Overbank flooding was known to have occurred during the spring month snowmelt and during summer monsoon rain events. These runoff-generated floods occurred from late April to June and were characterized by a general rise in the river, then an extended flood period, followed by a gradual recession of flood waters (Scurlock, 1998). These floods created and replenished wetlands and provided conditions for regeneration of cottonwoods and other riparian woody plants (Crawford et al., 1993). The upstream reservoirs have greatly reduced the chance for flooding in the Albuquerque Reach of the Rio Grande. Therefore, riparian regeneration and wetland creation would likely not occur within the project area.

3.2 ECOLOGICAL SETTING

The Tingley Ponds would continue to have water quality problems including low dissolved oxygen concentrations and outbreaks of avian botulism. The ponds would remain shallow and continue to have sedimentation problems. The water supply would remain unreliable and problematic. With these water quality and supply challenges aquatic habitat and species diversity would remain very low. Tingley ponds would not be sustainable and marginal habitat would exist. Around the ponds, vegetation would continue to be sparse and low in species diversity. The ponds would remain unlined and water from the ponds would continue to move into the Riverside Drain. The project area, particularly Tingley Ponds, would remain in a degraded, unsightly state.

The riparian community in this area would not gain any value for wildlife or the public. The understory would remain exotic with dead limbs covering the ground. The understory of the area would continue to be dominated by exotic vegetation. Diversity in the project area would remain low. Educational and recreational opportunities in the immediate area regarding the riparian systems of the Middle Rio Grande would remain limited.

SECTION 4 ALTERNATIVE FORMULATION

4.1 FORMULATION OF ALTERNATIVES

4.1.1 Formulation Process

The Corps planning process includes six steps that is a structured approach to problem solving which provides a rational framework for sound decision making. These steps include: 1) identifying problems and opportunities; 2) inventorying and forecasting conditions; 3) formulating alternative plans; 4) evaluating alternative plans; 5) comparing alternative plans; and 6) selecting a plan. Problems and opportunities are defined then the study objectives and the constraints that will guide efforts to solve these problems and achieve these opportunities. The second step is to develop an inventory and forecast of critical resources relevant to the problems and opportunities under consideration in the planning area. Developing and comparing alternatives which consist of a system of structural and nor nonstructural measures to meet, fully or partially, the identified study planning objectives subject to constraints. This is an iterative process which should lead to selection of a plan that meets the project objectives and meets all Corps policy and guidance.

4.1.2 Management Goals and Constraints

Beginning in 1999, the City of Albuquerque facilitated several planning sessions with the Corps, to discuss the objectives of the City's overall restoration plan for the Tingley Ponds and adjacent bosque. This section summarizes management goals and constraints specific to the Corps' portion of the overall plan. The initial objectives of this Section 1135 feasibility study included (in increasing order of importance):

- restore Tingley Ponds to a sustainable aquatic system,
- provide suitable habitat to allow for a sustainable native fishery in the Central Pond,
- use as much of the available space to create adequate volumes for suitable fish habitat,
- restore three distinct wetland communities (deep marsh, shallow marsh and wet meadow) to the riparian ecosystem in Albuquerque Reach of the Rio Grande,
- provide additional habitat for wetland dependent wildlife (i.e. amphibians, fish and waterfowl)
- increase recreational and educational opportunities for citizens of Albuquerque, and,
- improve the aesthetic appearance of Tingley Ponds and the immediate area.

4.1.3 Project Constraints

The size and scope of the project is limited by several constraints listed below.

- Water availability, of 400 gpm from shallow ground water wells (existing), is the limiting factor in wetland creation, limited the size of the wetlands. Water supply could not be increased by diverting water from the Rio Grande system due to a fully allocated river system.
- Tingley Ponds cannot be moved to another space due to land availability/ownership constrains.
- MRGCD noted that they did not want water from the ponds seeping into the riverside drain any longer.
- MRGCD limited the amount of riparian area to be restored and the number of cottonwoods to be destroyed.
- The area is a high use recreation area.
- The "put and take" fishery designation by NMDGF must be maintained.

4.1.4 Alternative Descriptions

After several meetings with the City of Albuquerque, the Corps developed a list of final project alternatives for evaluation within the feasibility report. Due to constraints (i.e. water supply and available land) and opportunities the alternatives were based on optimization of the existing water supply and designated land uses. Several different water volumes (i.e., 100, 200, 400, 700, and 1400 gpm) were considered for analysis to achieve optimal aquatic and wetland outputs.

Most alternatives considered Tingley Pond restoration and wetland creation as a positive externality and use of the water. One alternative, however, considered Tingley Pond restoration and piping the water directly to the Rio Grande to benefit the Federally listed endangered Rio Grande silvery minnow.

The goals and outputs were identified and small variations or management measures were used to evaluate alternatives. This allowed the team to determine the most cost-effective version of the alternative. Each alternative was assigned a project life of 50 years. Alternatives were analyzed where wetland and pond incremental features (size, depth, type of aeration) were compared to environmental outputs. An ideal reference reach based on a mixed riparian wetland community was used as the preference within the current river regime.

4.2 EVALUATION OF THE PREFERRED ALTERNATIVE

This project would improve the quality and quantity of the existing ponds by improving the water supply by upgrading two existing groundwater wells and expanding their overall size (City of Albuquerque, 1991). Approximately 8.7 acres of pond restoration would include improvement of aquatic habitat, reducing the potential of avian botulism outbreaks and the reduction of soil erosion through bank stabilization. Approximately 48 acres of riparian forest " bosque" would be restored by removing the exotic understory and planting native trees and shrubs in the area inside the leveed floodway. Within the 48 acres, approximately 8 acres of wetland habitat would be created.

The flood control projects, mentioned in Section 1.1, have led to a decline in native riparian regeneration, loss of wetlands and an increase in fire danger. These flood control projects have decreased overbank flooding; an event essential to proper riparian function. Wetlands are an integral component of the bosque ecosystem, not only increasing its diversity but also enhancing the value of surrounding plant communities for wildlife. Wetlands have experienced the greatest historical decline of any floodplain plant community. Among the greatest needs of the riparian ecosystem are the preservation of existing wetlands and expansion or creation of additional wetlands (Crawford et al., 1993).

The restoration of three wetland communities in the bosque would augment some of the biological values historically lost and in enriching the habitat value of the bosque ecosystem. This potential interface of wetlands with the riparian vegetation provides increased habitat diversity and is reflected in higher animal species and abundance (Crawford et al., 1993). Approximately 260 jetty jacks would be removed from the riparian project area as well. These jetty jacks are no longer required for flood control purposes and the US Bureau of Reclamation, Albuquerque Area Office, has granted permission to remove the jetty jacks in this area (Martin, 2001).

Education would be an important aspect of this project because of its sponsorship by the City's Biological Park, located southeast of the project area, and planned incorporation into the Park's public programs. The Park would develop interpretive programs that describe the functions and values of bosque and wetland habitats within the context of traditional, current, and future land and water resource development in the Middle Rio Grande valley.

Human interaction with the environment would be enhanced at the Tingley Ponds and created wetlands. Improved interaction would increase the use by the general public while providing a sustainable ecosystem for Tingley Ponds and the wetlands. Bicyclists and hikers would use proposed trails. The trail system and observation points near the proposed wetlands would encourage visual appreciation. Passive recreational activities at the observation points and trails include bird watching, photography and general aesthetics. The pier would be used to educate observers about Rio Grande ecosystem and wildlife. The NMDGF, independent of this 1135 project, would stock native and non-native fish in the Tingley Ponds.

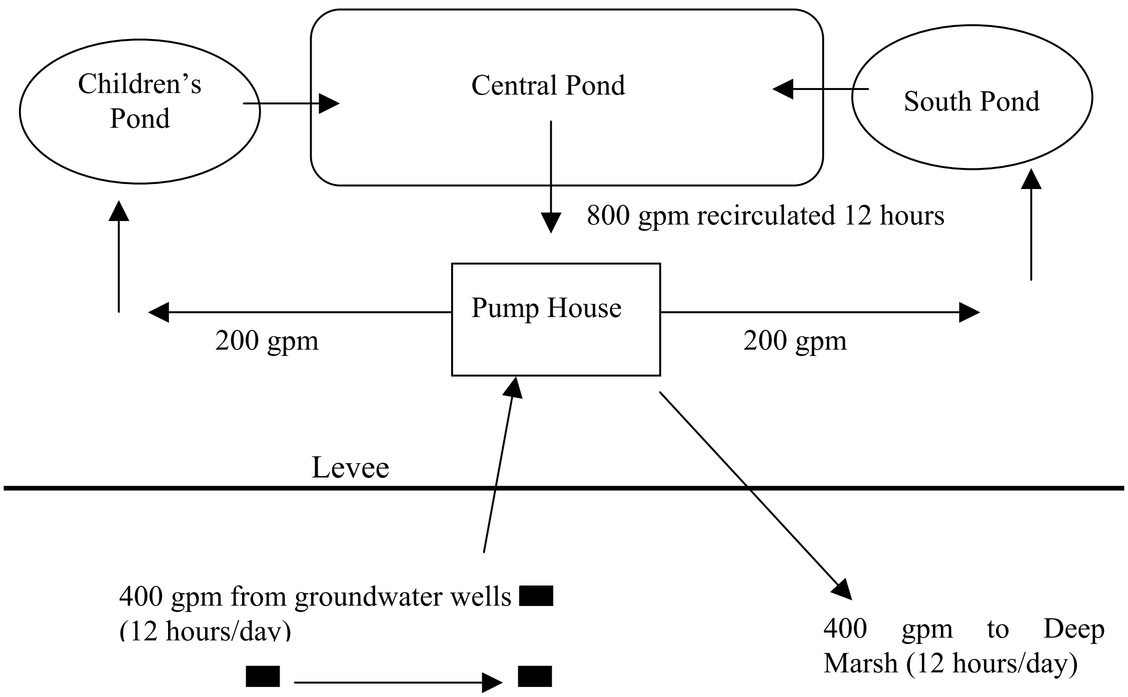
4.2.1 Water Budget

The water supply for Tingley Ponds would be from existing rehabilitated groundwater wells located in the bosque on the west side of the levee. A schematic showing the water supply and recirculation plan is provided below. The amount of water that the City is currently providing from the wells is 400 gallons per minute (gpm). Of the 400 gpm provided from the wells, the proposed project would pipe 200 gpm into the Children's Pond and 200 gpm into the South Pond for 12 hours each day. Water would flow from these two ponds via transition streams into the larger Central Pond.

The recirculation system would pump approximately 800 gpm directly from the Central Pond. Of this 800 gpm, 400 gpm would be piped to the deep marsh of the wetland communities (see

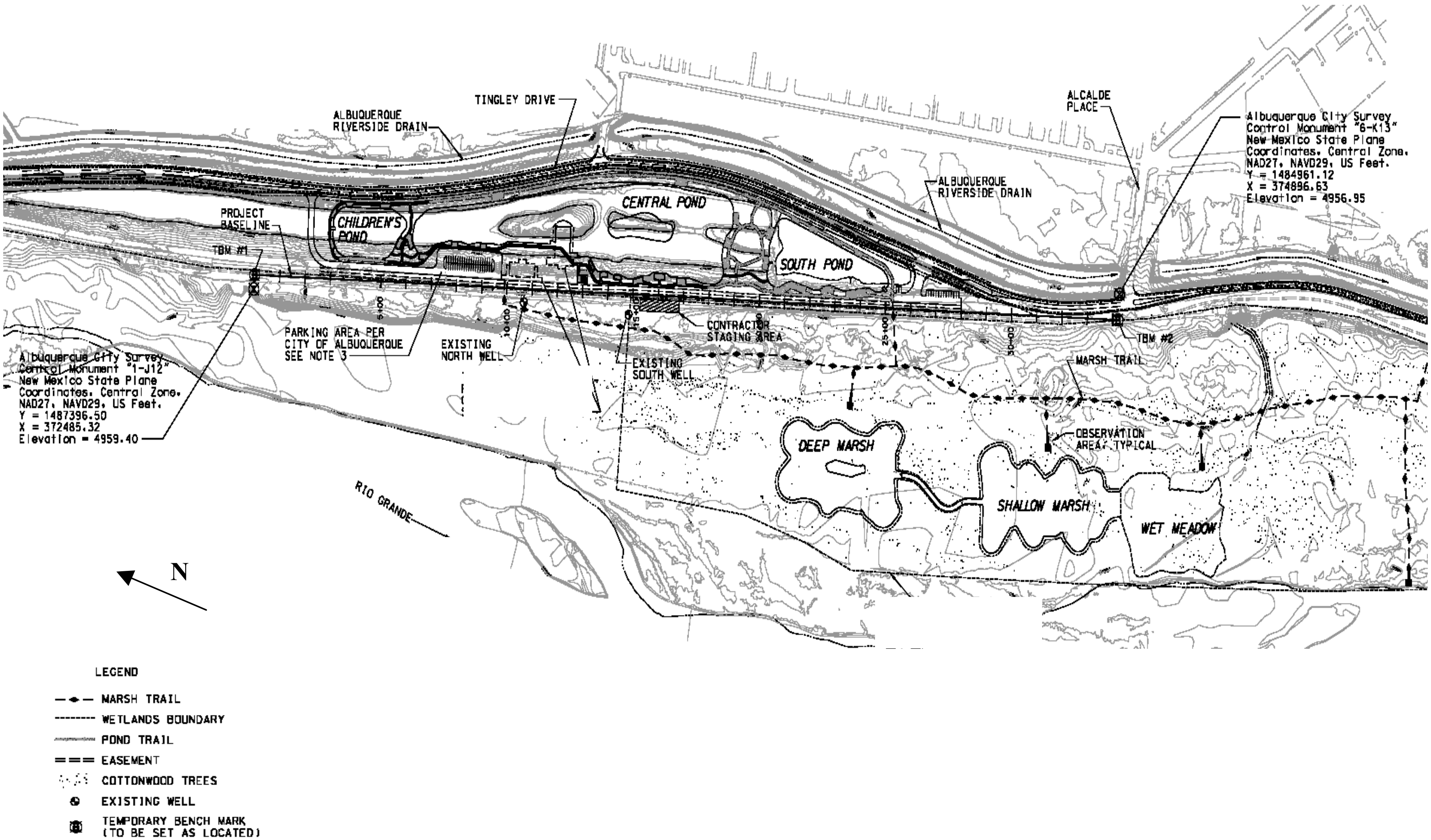
Figure 4.2-1). The remaining 400 gpm would be evenly divided between the Children's Pond and the South Pond during the period in which the groundwater wells aren't supplying water (remaining 12 hours).

Tingley Pond Water Supply Schematic



A water budget was created for the wetlands based on base flows from the water availability of the groundwater wells. Developing quantities for base flow criteria were based on wetland configuration, depths, evapotranspiration rates, and volumes. A water exchange cycle of once every six days for maximum depths was the maximum flow criteria. It was found that providing a 12 hour cycle with 400 gpm is sufficient to maintain a healthy wetland system with a 6-8 day turnover rate. This criterion was combined with the water supply requirements for aquatically sustainable ponds.

Figure 4.2-1. Overall Site Plan for the Tingley Pond and Wetland Creation (not to scale)



4.3 INCREMENTAL COST ANALYSIS AND PLAN SELECTION

Corps regulations require that ecosystem restoration projects be analyzed for cost effectiveness and incremental benefits expected from contemplated restoration alternatives. Analysis of cost-effectiveness, in general, compares the relative costs and benefits of alternative plans. To compare the cost effectiveness of various restoration alternatives, an environmental output unit is required. An output is the quantification of expected improvement in target functions or values, such as increased productivity or habitat suitability.

Design models were developed for both the Tingley Pond and Wetland Creation. To determine the most cost effective Tingley Pond options for potential and incidental benefits an environmental output was developed for Tingley ponds. Management measures (i.e. pond depth, water volume, aeration and recirculation) were integrated to determine their effects on dissolved oxygen (DO) and temperature levels of the ponds, where greater DO levels and lower temperatures are desirable.

A Relative Habitat Functional Assessment Model was developed to achieve an environmental output for the created wetlands. Wetland functions were identified for each wetland community. To assess how each function relates to habitat improvement, a matrix was developed that quantitatively links direct and indirect benefits to target species on a relative scale. Target species were selected based on the habitat type (i.e. wetlands and aquatic habitat) being created. This design model was used to determine the amount of habitat units projected for each wetland community type.

Individual incremental cost analyses (ICA) were performed for both the Tingley Pond and the wetland creation portions of the proposed project. No tradeoff analysis weighing aquatic habitat versus wetland habitat was performed because the wetlands are treated as positive externalities to the aquatic habitat restoration plans. The following discussion was adapted from the ICA report.

The Corps software program IWR-PLAN was used to conduct the ICA. In order to enter the alternative restoration features and plans into the software, each feature or plan was provided a unique identifier code.

TABLE 4.3-1 POND MANAGEMENT MEASURE SUMMARY

Management Measure	Code	Scale - Description					
Well water supply	A	A0 – do nothing	A1 – 100 gpm inflow ($227,400)	A2 – 200 gpm inflow ($227,900)	A3 – 400 gpm inflow ($231,500)	A4 – 700 gpm inflow ($237,700)	A5 – 1400 gpm inflow ($251,000)
Surface aeration	B	B0 – do nothing	B1 – Use surface aeration* ($200,900)				
Bottom aeration	C	C0 – do nothing	C1 – Use bottom aeration* ($150,700)				
Recirculation Pump	D	D0 – do nothing	D1 – Recirc. 200 gpm ($67,700)	D2 – Recirc. 400 gpm ($71,300)	D3 – Recirc. 800 gpm ($77,500)		
Excavation	E	E0 – do nothing	E1 – Excavate to 10' depth (20M gal.) ($1,249,800)	E2 – Excavate to 15' depth (30M gal.) ($1,726,700)	E3 – Excavate to 20' depth (40M gal.) ($3,873,100)		

*Management Measures B1 and C1 are mutually exclusive.

TABLE 4.3-2 WETLAND MANAGEMENT MEASURE SUMMARY

Management Measure	Code	Scale - Description					
		No Action	100 gpm	200-gpm	400 gpm	700 gpm	1400 gpm
Deep Marsh	A	A0	A1 ($0)	A2 ($0)	A3 ($403,700)	A4 ($706,900)	A5 ($1,413,800)
Shallow Marsh	B	B0	B1 ($47,200)	B2 ($88,100)	B3 ($230,900)	B4 ($404,400)	B5 ($808,000)
Wet Meadow	C	C0	C1 ($31,700)	C2 ($58,800)	C3 ($291,000)	C4 ($509,700)	C5 ($1,018,300)
Riparian Habitat*	D	D0	D1 ($112,000)	D2 ($110,200)	D3 ($95,100)	D4 ($80,900)	D5 ($47,700)
Combined Habitat	E	E0	E1 ($146,900)	E2 ($257,200)	E3 ($1,020,600)	E4 ($1,701,900)	E5 ($3,287,900)

Riparian Habitat costs decrease as water use increases because the habitat is a complementary use for the limited space relative to the other habitat types.

Tingley Pond Findings

The first effective measures that increase output were those increasing well water supply, though adding bottom aeration to maximized inflows produced cost-effective outputs prior to the next pond depth. Once the pond receives maximum inflows from the well, the next cost effective output was the inflow plus recirculation, followed by maximum inflows plus recirculation plus bottom aeration.

It is important to note that efficient alternatives use more water than the recommended plan. While the wells providing water to the aquatic habitat can provide up to 1400 gpm, the sponsor has indicated that other considerations limit water consumption to under 400 gpm. A second sensitivity was conducted to evaluate the impacts of limiting water use on plan selection. The costs and outputs generated of efficient/effective alternatives in this analysis are presented in Figure 4.3-1.

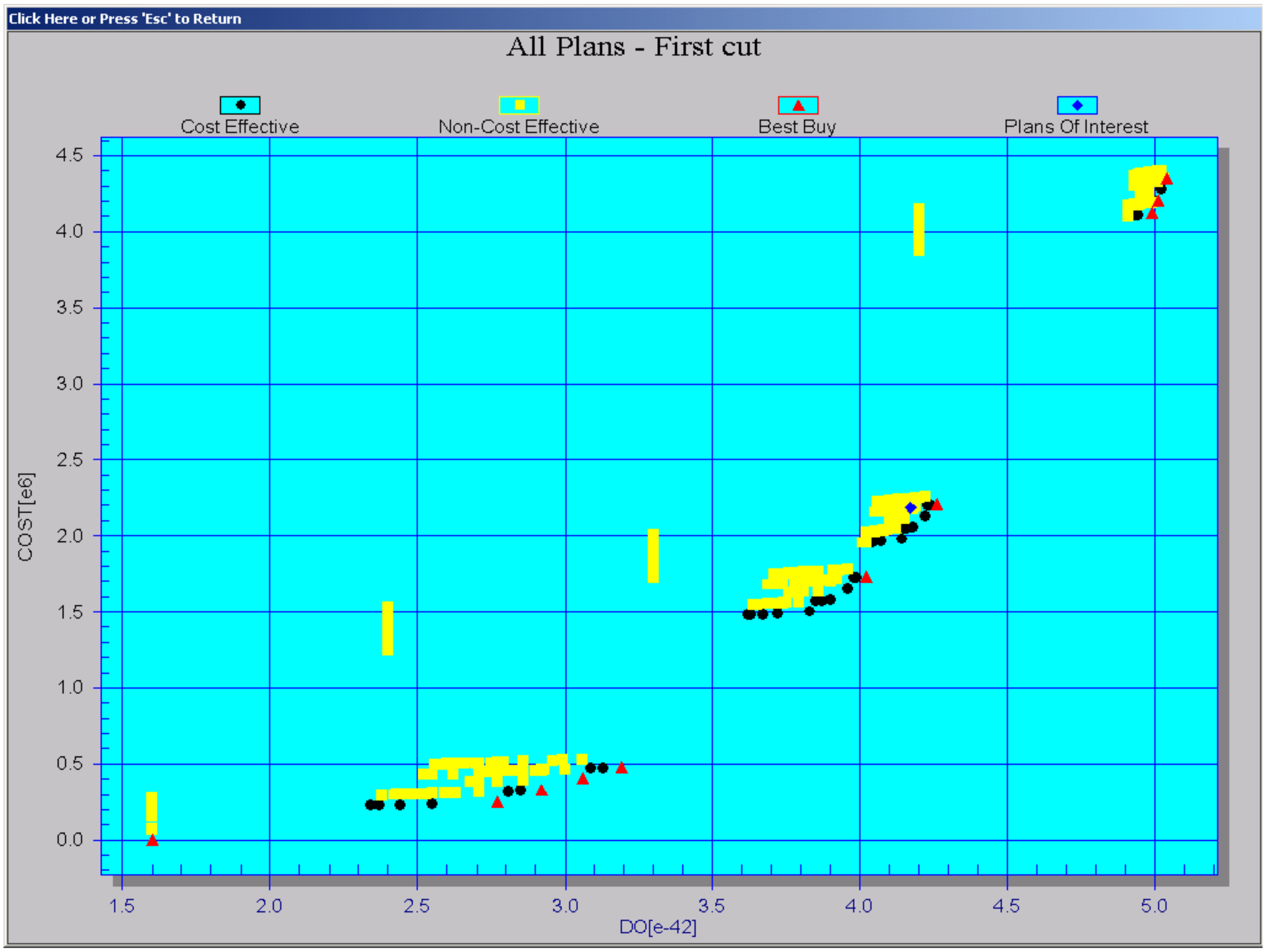


Figure 4.3-1 All Aquatic Habitat Plans (differentiated, DO as output)

Wetland/Riparian Findings

Generally, deep marshes and alternatives including deep marshes are not cost-efficient ways to generate HUs, up until the mixed habitat. The cost-effectiveness analysis indicates that combinations of shallow marshes and/or wet meadows can produce as much or more HU than the first deep marshes. The combined output generally becomes efficient and effective because combinations of the other habitat types cannot produce as much output at 400 gpm as the combination wetland.

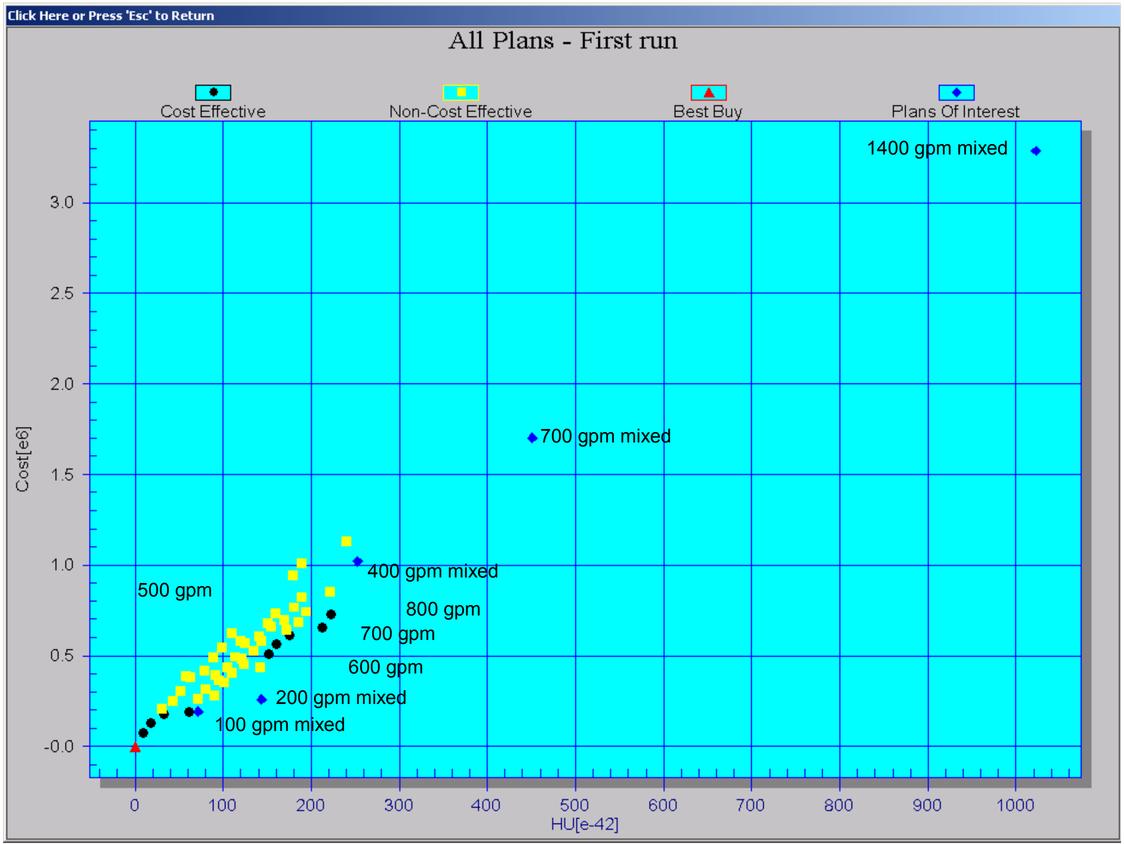


Figure 4.3-2 Incremental Cost of Wetland Habitat Best Buy Plans

A sensitivity analysis was performed to see the effects of limiting water consumption to 400 gpm. The results indicate that there are some efficient/effective alternatives that are eliminated due to the restricted water use.

The preferred alternative, the 400 gpm mixed habitat, appears to be an efficient/effective way to use the water and maximize habitat creation, and provides maximum benefits for the water use.

Tradeoff Analysis and the production possibilities frontier:

The purpose of tradeoff analyses is to catalog opportunity costs of various plans prior to selecting the recommended plan. In this study, certain factors were identified for inclusion into the tradeoff analysis, which were supplemented by new findings during the analysis. These traits and their impacts on final selection for a plan are discussed below.

One concern that developed early on in planning this report was how a fish's value to the environment was going to be compared to a tree's value to the environment. Does the plan to develop aquatic and wetland habitat force a decision as to which output is preferable? The short answer is no. This analysis routes water into the aquatic habitat first. The management measures improve the aquatic habitat by increasing dissolved oxygen (DO) and lowering temperature. The water is then pumped to the wetlands via a conveyance with no water loss. In effect, the wetland options analyzed are treated as positive externalities to the aquatic habitat restoration alternatives. Therefore, no tradeoff analysis weighing benefits of aquatic habitat vs. wetland habitat is necessary.

4.4 ALTERNATIVES CONSIDERED BUT ELIMINATED

Water Supply Alternatives

Alternatives for the ICA included the following flows: 100, 200, 400, 700, and 1400 gpm. The project sponsors have indicated that water rights issues make pond inflows greater than 400 gpm infeasible.

Volumes less than 400 gpm would create marginal aquatic habitat in the Tingley Ponds. Reducing the volume of water introduced to the ponds, would limit the amount of water available to the wetlands. These volumes (100 and 200 gpm) would not allow for a deep marsh community, thus reducing the potential amount of biological diversity in the project area. Also, the ICA determined that the efficient wetland alternatives that use more water are cheaper than those using less water. The deep marsh is an important component of the wetland creation efforts in the bosque.

Discharging 400 gpm Directly to the Rio Grande

An alternative that was considered but eliminated from further consideration included piping the 400 gpm from Central Pond and discharging it directly into the Rio Grande. This alternative was eliminated due to the relatively small amount of water available to discharge, which equates to approximately 0.88 ac-ft/day or 322 ac-ft/yr. This volume of water is less than 1.0 percent of the average annual flow, which is approximately 600,000 gpm or 967,805 ac-ft/yr, in the Rio Grande. The addition of 400 gpm would not significantly affect the flows in the Rio Grande. Therefore, it was determined that restoring approximately 8 acres of wetlands to the bosque would provide a greater environmental output than discharging 400gpm to the river.

SECTION 5 RECOMMENDED PLAN

5.1 THE PREFERRED ALTERNATIVE (400 GPM)

This action alternative would supply 400 gpm from the groundwater wells located in the bosque. From the ponds the 400 gpm would be pumped to the deep marsh community. The ponds and wetlands were sized for 400 gpm inflow with a 6 day turnover rate. For ease of discussion the project has been divided into two sections, the Tingley Pond restoration and the wetland creation.

5.1.1 Tingley Pond Restoration

Restoration of the ponds would include providing better habitat for fish and other aquatic organisms by providing a reliable water supply, deepening the ponds, creating aquatic vegetation and habitat structures, recirculation, and providing bottom air diffusers. Figure 5.1-1 shows the overall Tingley Pond Plan.

An outside water supply is required to offset evaporative losses and to enhance fisheries habitat. The water supply would come from two upgraded groundwater wells located in the bosque, which would supply 400 gpm. The South and Children's Pond would receive 200 gpm from the groundwater wells for 12 hours. For the remaining 12 hours another 200 gpm would be added to these 2 ponds circulated from the Central Pond (see schematic in Section 4.2). Adding new water into the pond system creates a need for discharge. Water would then be pumped to the wetlands described in Section 5.1.2.

The Children's and South Ponds would have a maximum depth of 8 feet, while the Central Pond would be excavated to a maximum depth of 15 feet. Areas designated for heavy fishing would include a slope of 2:1 H.V. Areas where aquatic vegetation is desired flatter slopes of 3:1 H:V would be used.

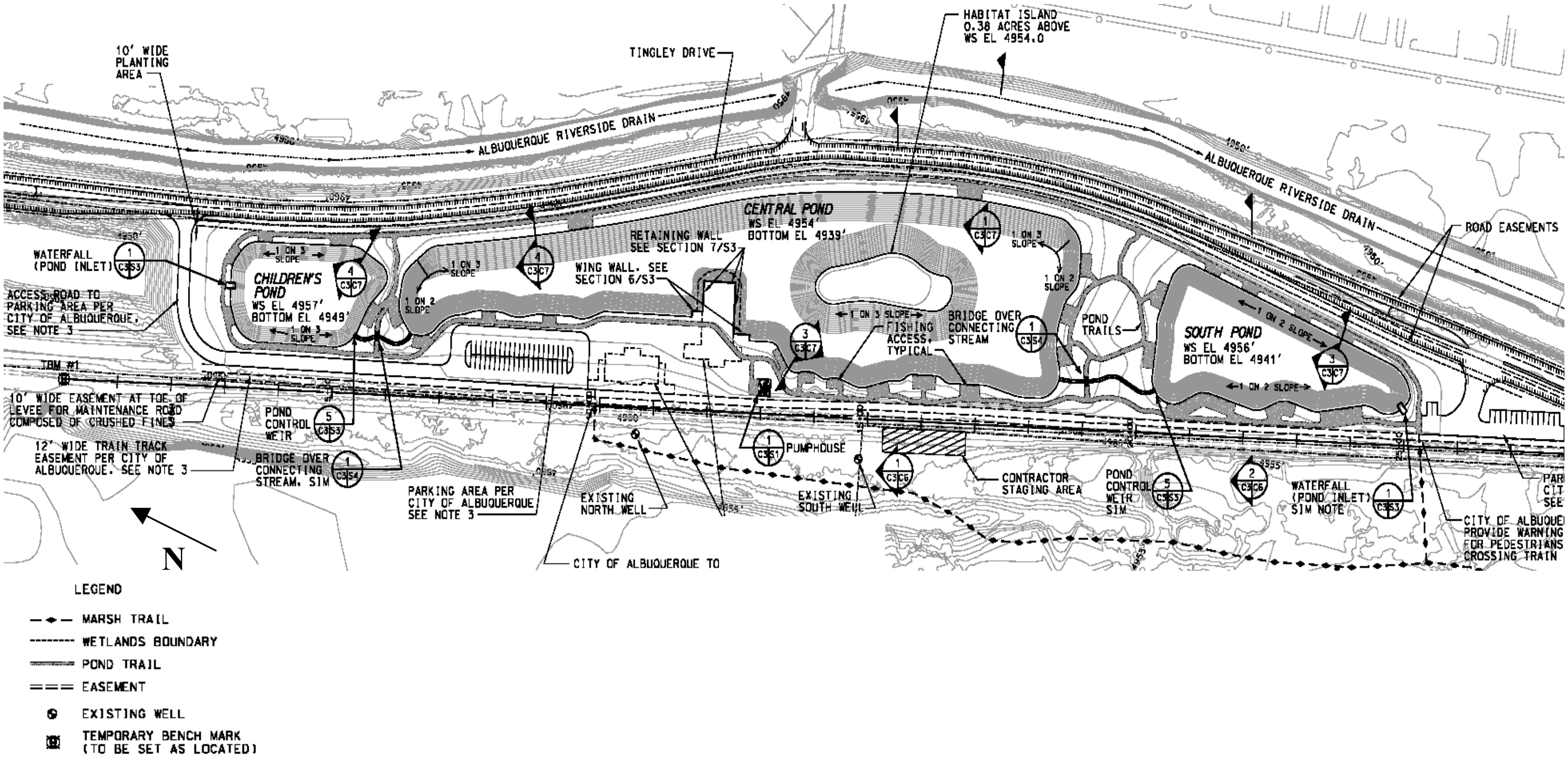
All three ponds would be lined to prevent pond water from seeping into the MRGCD's Riverside Drain with a double-textured, high-density polyethylene (HDPE) 60-mil thickness, and covered with 18 to 24 inches of soil and cobble. Cobble would line the 2:1 H:V slopes by deterring plant growth in designated fishing areas. While soil on the 3:1 H:V slopes would enhance aquatic vegetation growth and provide habitat for fish and other wildlife.

Additional aquatic habitat would be created within the ponds using rock reefs, rock piles, logs, and submerged vegetation at varying elevations. Other habitat elements for pond restoration include a small island in the center of Central Pond which would add habitat diversity by providing rock, woody debris, and submerged vegetation at different elevations for the fish to use for protection, spawning areas, etc.

The ponds would be planted with native wetland vegetation and planting densities will vary depending on desired goals. Planting densities are 1 plant/ft^2 for moist soil areas (water at 2 feet or less). For emergent wetland plants, found in water depths greater that 2 feet planting densities would be 1 plant/10 ft^2. Planting densities for grasses in the upland areas of the ponds would be 1 bunch/2 ft^2. A list of the plants species to be planted is included in Section 6.5.

Native fish that would be initially stocked in the Central Pond include: bluegill, longnose gar, red shiner, Rio Grande chub, fathead minnow, smallmouth buffalo, and mosquitofish. NMDGF would continue stocking the Children's and South ponds with rainbow trout in the winter months, which is independent of the Corps project. Stocking of catfish in the South Pond would also continue. The transition channel would be screened to keep catfish out of the Central and Children's Pond.

Figure 5.1-1. Tingley Pond Plan (not to scale)



5.1.2 Riparian Restoration and Wetland Creation

The riparian restoration and wetland creation project area is approximately 48 acres. The following activities would occur in this project area: wetland creation, exotic species removal, dead plant material removal, jetty jack removal, and the staging area. Of the 48 acres approximately 9 acres would be created wetlands. The riparian restoration effort in the remaining 40 acres would be exotic species removal and replanting and seeding of native riparian vegetation.

The proposed wetlands within the bosque would include deep marsh, shallow marsh, and wet meadow communities. The proposed area for the wetlands is located just west and south of the Tingley Ponds inside the levee. The placement and size of the wetlands considered the following issues 1) water supply, 2) optimize for earthwork quantities, 3) protection of existing cottonwood trees, and 4) existing slopes and pond areas. All Kellner jetty jacks would be removed in the project area to allow for construction of the wetlands and restore the riparian area surrounding the wetlands. The water supply for the wetland system would be pumped directly from the Central Pond and piped to the deep marsh.

A wetland hydroperiod was developed for this project based on water transfer rates and spring snowmelt period of high flow for the Rio Grande. These rates were developed using a pattern of water levels defining flood durations and minimum water circulation through the wetlands. During high-flow periods, the hydroperiod will show high-base flows that will keep the deep marshes at a 4 foot average depth, shallow marshes at a 3 foot depth and the wet meadow at 0.5 foot depth.

The wetland communities require a water transfer rate of one complete water cycle every six days. Based on the current wetland configuration, a minimum base flow of 400 gpm is required to pass through the system during the growing season (May – September). This minimum flow does not include the demands on the system such as transpiration, evaporation and groundwater infiltration or losses.

During high-flow periods, the hydroperiod will show high-base flows for the following community types:

1. The deep marsh (2.65 acres) would be designed with a maximum water depth of 4 feet and with an island (0.12 acres) to promote safe harbor and nesting areas for wildlife with interior slopes being 10:1 H:V and exterior being 5:1 H:V bank slopes,

2. The shallow marsh (2.90 acres) would be designed with a maximum water depth of 3 feet containing 3 open water areas (4 foot depth) with interior slopes being 10:1 H:V and exterior being 5:1 H:V bank slopes, and

3. The wet meadow (2.50 acres) 0.5 feet deep.

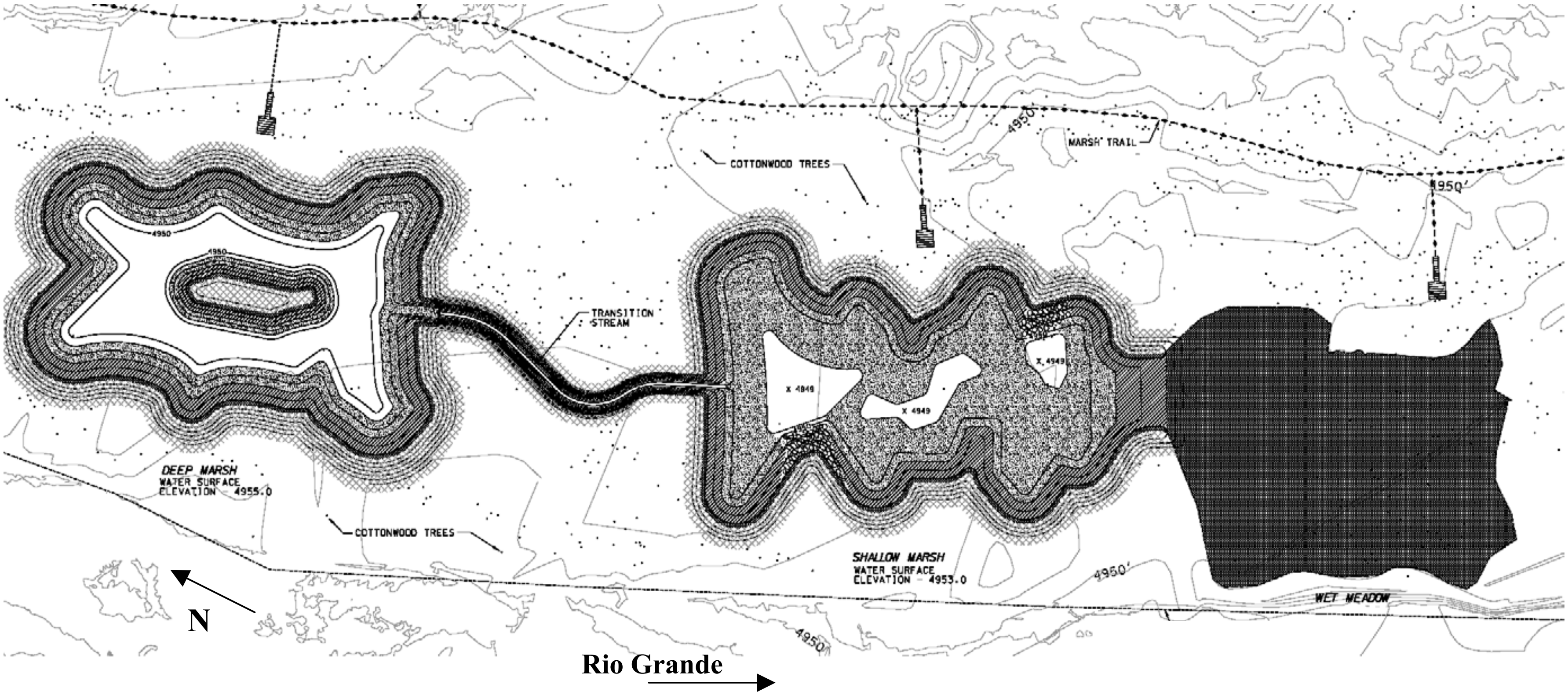
To facilitate flows between the deep and shallow marshes a contracted, notched rectangular weir was designed to pass the required flow. The water then passes from the shallow marsh to the wet meadow through a permeable berm. Each marsh would be slightly sloped toward the transition channel (deep) and permeable berm (shallow) to aid in full circulation and water transfer. The transition stream would be composed of fill that is lined with a low permeability layer to prevent water losses. The berms for the channels are at 2:1 H:V slopes that are three feet high and four foot along the bottom. The water would flow (via gravity) from the deep marsh to the shallow marsh into the wet meadow and finally into the adjacent bosque (Figure 5.1-2). The transition channels were designed to sustain a maximum velocity of 0.03 ft/second. Due to the sandy soils the deep marsh will be lined with a natural liner to prevent large amounts of water loss through infiltration.

Appropriate native plant species and local genetic stock would be planted for each community type. The wetlands would be planted with native wetland vegetation and planting densities will vary depending on desired goals. Planting densities are 1 plant/ft^2 for moist soil areas (water at 2 feet or less). For emergent wetland plants, found in water depths greater that 2 feet planting densities would be 1 plant/10 ft^2. Planting densities for grasses in the upland areas of the ponds would be 1 bunch/2 ft^2. Figure 5.1-2 shows the planting plan for each of the wetland communities. Table 5.1-1 shows examples of some of the plants species to be available for planting. Appendix B has a more complete list of all potential wetland and riparian species.

TABLE 5.1-1 EXAMPLES OF NATIVE PLANT SPECIES AVAILABLE FOR VEGETATION EFFORTS IN THE TINGLEY POND, WETLAND CREATION AND RIPARIAN RESTORATION PROJECT AREAS

Type of Wetland and Riparian Species	Scientific Name	Common Name
Riparian Trees and Shrubs		
	Forestiera pubescens	New Mexico olive
	Amorpha fruiticosa	False indigo bush
	Populus deltoides ssp. *wislizenii*	Rio Grande cottonwood
	Ribes aureum	Golden-currant
	Salix exigua	Coyote willow
Wetland Plants (moist soil to 2 inches below the water surface)		
	Anemopsis californicus	Yerba manza
	Carex emoryi	Emory sedge
	Distichlis stricta	Saltgrass
	Scirpus pallidus	Cloaked bulrush
Emergent Plants (2 inches to 2 feet below the water surface)		
	Nasturtium officionale	Watercress
	Sagittaria latifolia	Arrowhead
	Scirpus americanus	Three square bulrush
	Scirpus validus	Softstem bulrush
Submergent Plants (2 feet to 4 feet below the water surface)		
	Elodea Canadensis	Elodea
	Potamogeton pectinatus	Sago pondweed
	Ranunculus longirostris	White water crowfoot
	Zannichellia palustris	Common poolmat

Figure 5.1-2 Wetland Site and Planting Plan (not to scale)



LEGEND FOR RIPARIAN PLANTS

SYMBOL	PLANTS	BOUNDARY	DENSITY
	RIPARIAN GRASSES	10' FROM TOE OF BERM TO +.5' FROM WATER SURFACE	1 PLANT/2 SQ FT
	WETLAND PLANTS (RUSHES, SEDGES)	+.5' TO -2" OF WATER SURFACE	1 PLANT/1 SQ FT
	EMERGENT PLANTS (RUSHES)	-2" TO -2' OF WATER SURFACE	1 PLANT/1 SQ FT
	SUBMERGENT PLANTS	-2' TO -4 OF WATER SURFACE	1000 PLANTS/ACRE

Approximately 40 acres of bosque would be restored by enhancing hydrology and native vegetation. Mainly non-native vegetation in the understory would be removed through brush cutting and localized herbicide application. Existing native vegetation would be retained wherever possible. Following non-native vegetation removal, native cottonwood and willow seedlings would be encouraged to germinate with a more hydrologically suitable environment. Cottonwood and willow poles would be planted in the areas cleared of non-native vegetation.

Recreational features within the wetland creation area would include an approximately 5,100 linear foot trail system, educational signs, benches, and garbage cans. The trail would be reconstructed to comply with Americans with Disabilities Act (ADA) by properly resurfacing and grading. The trail system would traverse the restoration area while educational signs would inform observers of the ecological function and importance of each plant community. The educational signs, benches and garbage cans would be located at designated observation points. A 50 foot buffer between the observation points and the wetlands would be maintained. Additional habitat features include the placement bat houses around the wetland communities.

Access, staging area and waste disposal area were determined through coordination with the City of Albuquerque to facilitate construction activities. The staging area would be located within the 48 acres project are of bosque restoration. Access to the ponds would be from Tingley Drive and the levee.

5.1.3 Construction Considerations

Stormwater Pollution/Erosion Considerations. The potential for stormwater pollution during construction is minimal for this project. A National Pollutant Discharge Elimination System permit would be obtained by the construction contractor.

Construction would occur begin during late fall early winter. This is to minimize wildlife disturbance especially during breeding periods.

All waste material would be disposed of properly at pre-approved or commercial disposal areas or landfills. Fuel, oil, hydraulic fluids and other similar substances would be appropriately stored away from the Rio Grande and must have a secondary containment system to prevent spills if the primary storage container leaks. All heavy equipment operating in or near river floodplain should carry an oil spill kit or spill blanket at all times.

5.2 OPERATION AND MAINTENANCE CONSIDERATIONS

Currently, the annual costs for operation, maintenance, repair, labor, replacement and rehabilitation (OMRR&R) are estimated to be $85,800. This value includes project inspection (at least once yearly). This includes equipment maintenance of recirculation and well pumps, diffusers, side stream booster pumps, irrigation system, ozonenator and plant care and replacement.

For most Corps civil works projects, the responsibility for OMRR&R is assumed by the local Sponsor following construction of the project. Upon completion of construction, the Corps would complete an Operations and Maintenance manual for the project that will summarize all OMRR&R requirements.

5.3 PROJECT IMPLEMENTATION PROCEDURES AND SCHEDULE

Remaining actions necessary for the approval and implementation of this project are summarized below.

- The final Detailed Project Report and the draft PCA will be transmitted to the Division Engineer, South Pacific Division, Corps of Engineers, for approval.
- The PCA will be signed by the City of Albuquerque and the Federal Government.
- The Corps of Engineers and the City of Albuquerque will complete the final project design and the construction contract specifications.
- The Corps of Engineers and the City of Albuquerque will conduct pre-award activities. These activities will include issuing plans and specifications to interested contractors, soliciting construction bids, review of submitted bids, obtaining required Clean Water Act permits and certification, and so on.
- A contract will be awarded to build the project.

PCA execution and the initiation of the Plans and Specification phase is anticipated to begin in January 2004. The construction contract is expected to be awarded in April 2004, and construction activities would take place within the April through September 2005 period. Monitoring would continue for five years following construction.

5.4 MONITORING AND ADAPTIVE MANAGEMENT

Due to the relatively recent emergence of restoration science and inherent uncertainty in ecosystem restoration theory, planning, and methods, success can vary due to a variety of technical and site-specific factors. Recognizing this uncertainty, it is prudent to allow for contingencies to address potential problems in meeting restoration goals, which may arise during, or after, project implementation. Corps guidance recommends the inclusion of "adaptive management" techniques in projects with the potential for uncertainty in achieving restoration objectives. Post-project monitoring is a crucial requisite of the adaptive management process since performance feedback may generate new insights on ecosystem response and provides a basis for determining the necessity or feasibility of subsequent design or operational modifications. Success should be based on a comparison of post-project conditions to the restoration project objective(s).

Monitoring of project performance and success would be conducted for five consecutive years following construction/vegetative planting. Monitoring at Tingley Pond would include water quality measurements, vegetation survival, exotic species removal and fish species composition. Wetland monitoring would include vegetation survival, exotic species removal, general species composition. An effort would be made to connect the projected habitat units output to the results of the monitoring. Sampling would occur during the spring and fall.

A recent addition to mosquito born diseases has occurred in New Mexico. West Nile Virus was first documented in the State in 2002. Adaptive management strategies for dealing with mosquitoes would include introducing the predaceous fish *Gambusia* into the wetland communities (deep and shallow marsh). The wetland system was designed so that water would be exchanged every 6 to 8 days. Every effort to reduce mosquito larvae would be implemented. Placing bat houses in the area would also abate adult mosquito populations in the project area.

5.5 REAL ESTATE REQUIREMENTS

All of the real estate is located in, is owned by or is under control of, the City of Albuquerque. The City is a municipal entity and adheres to normal real estate practice and laws. For the purposes of this real estate plan, the real estate will be treated as if it were available to the open market. This will be necessary for the crediting issues of this project. Real estate values will be compared to similar type lands and estates. Minimum land requirements for this project are described by ER 405-1-12 paragraph 12-9b(6). The City of Albuquerque holds Fee Title to the pond area and MRGCD holds Fee Title to the bosque/wetlands area. Required lands are held under standard estates. MRGCD has been a non-Federal sponsor on several past district projects and has expressed strong support on this project. They will provide appropriate easement for the desired restoration area. All construction access to the sites is by public roadway. All contractor staging is to be within the defined project boundaries. Lands, easements, rights-of-way, relocations, and waste material disposal areas (LERRD) value for permanent easements is approximately $241,500.

5.6 PROJECT COSTS

Table 5.6-1 outlines current and future project costs. The feasibility level cost estimate summary is included in Table 5.6-1. This feasibility study was accomplished with Federal funding. The Total Project Cost includes the feasibility, plans and specifications, and implementation phases and is subject to cost-sharing as specified in Section 5.7.

TABLE 5.6-1 PROJECT COSTS ITEMIZED BY FEATURE

Feature	Cost (in dollars)
Detailed Project Report	$450,000
Plans and Specifications	$508,700
LEERD	$241,500
Fish and Wildlife Facilities	$4,960,000
Construction Management	$311,800
Total Project Cost	**$6,472,000**

[a] Implementation costs are based on 2003 dollars and includes a contingency of 12 to 15% depending on the feature.

5.7 COST SHARING REQUIREMENTS

The City of Albuquerque requested the current proposed project and would serve as the local cost-sharing Sponsor of the project. The cost-sharing requirements and provisions would be formalized with the signing of a Project Cooperation Agreement (PCA) between the City of Albuquerque and the Department of Army following approval of this Detailed Project

Report/Environmental Assessment. In the PCA, the Sponsor would agree to pay 25% of the total project cost, which includes the feasibility study, plans and specifications phase, and implementation (construction).

The basic criterion for non-Federal cost-sharing responsibilities for Section 1135 projects is to provide 25 % of total project costs, as further specified below:

> Unless assumed by Federal Government, provide all lands, easements, and rights-of-way, including those necessary for borrow and dredged or excavated material disposal, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation and maintenance of the Project.
>
> Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.
>
> Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project to the extent and in such detail as will properly reflect total project costs and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 33 CFR 33.20.
>
> Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

The total project cost is $6,472,000.00. The cost-sharing provision of the Section 1135 program prohibits the Federal Government from spending more than $5,000,000 for any one project. Therefore, the cost-share amounts would be $4,854,000.00 Federal and $1,618,000.00 non-Federal. Table 5.7-1 shows the breakdown of Federal and non-Federal costs for the proposed project.

TABLE 5.7-1 ITEMIZED PROJECT COSTS

Phase /Item	Total Cost	Federal Expenditure	Non-Federal Expenditure
Feasibility study	$450,000	$450,000	
Plans and Specifications	$508,700	$508,700	
Lands and Damages	$241,500		$241,500
Fish and Wildlife Facilities	$4,960,000	$3,583,500	$1,376,500
Construction Management	$311,800	$311,800	
Total	$6,472,000	$4,854,000	$1,618,000
Percentage	100%	75%	25%

[a] Feasibility study is initially Federally funded and is subject to cost sharing.
[b] Work-in-kind. (Amount of work-in-kind is subject to change in final PCA.)

Total Project Cost - $6,472,000.00.

Federal Share	**Non-Federal Share**
$4,854,000 (75%)	$1,618,000 (25%)

<u>Breakdown of non-Federal Cost:</u>

Real Estate	$ 241,500
Cash	$1,376,500
Total Non-Federal Share	$1,618,000

5.8 CONSISTENCY WITH PROJECT PURPOSE

The construction and operation of the proposed Section 1135 project would be consistent with the authorized purposes and current operation of Jemez Canyon and Cochiti Dams. Additionally, the proposed project would not alter the extent or frequency of damaging discharges within or downstream from the project reach.

SECTION 6 ENVIRONMENTAL EFFECTS

6.1 HYDROLOGY AND GEOMORPHOLOGY

No sediment or water would be directly discharged into the Rio Grande by any of the proposed alternatives. The wetlands and pond water supply will be from the existing groundwater wells and not from the Rio Grande. These wells have been in existence since 1977 and would be rehabilitated (City of Albuquerque, 1991). Therefore, there will be no new depletions of Rio Grande water from the system. Neither the proposed action nor no action alternative would affect the geomorphology or hydrology of the Rio Grande.

6.2 SOILS

Under the proposed action impacts to soils would be negligible. Expanding the pond size from 10 to 18 acres would not degrade the existing soils and bank stabilization efforts would protect soil resources. Approximately 45,206 yd^3 would be excavated from construction activities for the ponds and approximately 8,971 yd^3 would be excavated for the wetlands (deep and shallow marsh). The soil excavated from the ponds would be used as fill in the northern section of the ponds (near Central Avenue). The soil excavated from the wetlands would be used as fill for the berms that would be constructed around the deep and shallow marshes. However, the fill from excavation is not adequate to construct the berms so fill would be obtained from an appropriate site.

6.3 WATER QUALITY

Under the proposed action water quality of the ponds will be improved by recirculation and aeration. Upgrading the groundwater wells will provide a reliable source of relatively high quality water to the ponds. Dissolved oxygen would be improved through the addition of new water, circulation, and aeration of water. Water moving from the two small ponds into the larger Central Pond via transition streams will create more vertical column diversity and input cooler more oxygen rich water.

Along with the addition of 400 gpm of cool ground water for 12 hours/day and 400 gpm of cool well water pumped into the system for 12 hours, equals to 200 gpm entering the South and Children's Pond, respectively for 12 hours. This allows for cooler more oxygen rich water to be added to the extremes of the Central Pond. However, with a recirculation pump running during the remaining 12 hours when the wells are not adding water, Tingley Ponds would receive 400 gpm over a 24 hour period and the transition streams would flow over this 24 hour period as well. This is a major benefit to maintaining the plants and animals that occur in these transition streams. A four to six day exchange rate of one complete volume replacement would be achieved with a recirculation system.

As spring turns to summer, the surface water warms up more rapidly than deeper water. As the difference in temperature increases between water surface and cool bottom water, two layers are formed. The temperature difference causes a density difference. This density difference creates a "physical" barrier that results in no mixing with the warm water at the surface and the cool water at the bottom. The pond has stratified. This stratification can last for weeks at a time especially in deep ponds. A major objective of water circulation is to destratify, or mix the deeper, cooler, oxygen deficient water with the shallow, warmer surface waters rich in dissolved oxygen. This process is especially important in ponds deeper than 6 feet, which often stratify during warmer months. Circulating water in ponds is an effective tool in destratification that improves oxygen levels throughout the pond and increases microbial oxidation of organic matter (Lazur and Britt, 1997; and Losordo et al., 1998). Due to the limited groundwater volume (400 gpm), an important or deeper pond would not have this mixing and would remain stratified.

In a 1988 study (Fast et al., 1988) to determine effects of water depth versus artificial mixing (circulation); they found that deep ponds had more uniform temperatures, with less rapid temperature changes, greater whole pond respiration, and greater temperature and oxygen stratification. Circulation reduced thermal and oxygen stratification.

Circulating water also increases the suspension of nutrients, which can stimulate plankton growth and increase microbial activity. The recirculation system allows for water to be filtered and therefore scrubbed removing total ammonia nitrogen. A 2001 study found that total ammonia nitrogen was effectively reduced by digestion in a recirculation system (Zelaya, et al., 2001). Recirculation improves overall water quality by removing oxidized ammonia, nitrite-nitrogen, and carbon dioxide whereas just adding groundwater does not.

6.4 AIR QUALITY AND NOISE

Implementation of any of the action alternatives would not result in exceedances of existing Federal or state air quality standards. PM_{10} emissions from construction would be ameliorated by environmental design features and BMPs. Construction dust and vehicle emissions would be temporary, and would not be expected to incrementally degrade existing conditions.

Requirements stipulated in the *Development Process Manual* (City of Albuquerque, 1997) for construction activities mandate that the types of activities to be associated with construction of the ponds and wetlands must include implementation of the specific air-quality protection measures. Compliance with these measures would be required to obtain City construction permits, and implementation of these BMPs would ensure that substantial adverse effects on air quality would not result from construction or operation of the project. Revegetation efforts would greatly promote soil stabilization in the Tingley pond project area thus improving the air quality in the project area.

6.5 ECOLOGICAL SETTING

As a result of the proposed project the aquatic habitat of Tingley Ponds would significantly improve. The introduction of a reliable water source with aeration and recirculation would increase the pond's dissolved oxygen levels. Oxygen demand would increase with the size of the ponds thus biomass of fish and other aquatic organisms would increase; creating a more balanced system. The wetland creation/riparian restoration project would enhance biodiversity by increasing the amount of habitat and vegetation diversity.

Wildlife

Wildlife in the area would be affected during construction of the ponds and wetlands. These effects would be temporary and mobile wildlife would leave the project areas upon initiation of construction. The flightless ducks that currently reside at Tingley Ponds would be relocated to appropriate areas.

Several fish habitat enhancement structures have been incorporated in the Tingley Pond Restoration plan. Rock reefs, rock piles, stump cover root wads, fallen trees and brush/debris piles would allow for additional cover, shade and refuge for several life stage of fish. The following native fish would be stocked in Central Pond: longnose gar (*Lepisosteus osseus*), bluegill (*Lepomis macrochirus*), red shiner (*Cyprinella lutrensis*), Rio Grande chub (*Gila pandora*), fathead minnow (*Pimephales promelas*), smallmouth buffalo (*Ictiobus bubalus*), blue catfish (*Ictalurus furcatus*) and mosquitofish (*Gambusia affinis*)(FishPro, 2003).

Tingley Ponds would provide habitat for several species of wildlife (i.e. birds, invertebrates, amphibians, reptiles, and mammals). This area would have high levels of human disturbance. As a result, certain species that tolerate elevated levels of human disturbance would find the ponds attractive. Altogether a sustainable aquatic community with peripheral wetlands would attract several species that currently do not occur there.

The wetlands would create more open water habitat and edge habitat, thus increasing the quantity and quality of wildlife in the project area. Revegetation with native plants would increase the amount and types of food and cover available for wildlife and indirectly increase wildlife species richness or number of species. Fish and wildlife resources would benefit from the proposed project.

The wetland communities would enrich the local fauna by attracting many species of birds and other animals that are otherwise uncommon in the arid Southwest (Crawford, et al., 1993 and Mitsch and Gosselink, 2000). Up to 80 percent of vertebrate species in the arid West use western riparian habitats at some stage of their lives. More than 50 percent of the bird species in the American southwest breed in riparian habitats (Crawford et al., 1993 and Krueper, 2000). Hoffman (1990) found that the marsh community ranked the highest for density and species richness of birds in the Albuquerque Reach of the Rio Grande. Birds, particularly waterfowl (i.e. ducks and geese), are abundant in freshwater marshes (Mitsch and Gosselink, 2000). Specifically, pied-billed grebes (*Podilymbus podiceps*), Virginia Rails (*Rallus limicola*), soras (*Porzana carolina*), Common Yellowthroats (*Geothlypis tr*iches), American Coots (*Fulica americana*), Marsh Wrens (*Cistothorus palustris*), Song Sparrows (*Melospiza melodia*) and Red-winged Blackbirds (*Agelaius phoeniceus*) show preference towards marsh communities (Crawford et al., 1993 and Mitsch and Gosselink, 2000). Creating wetlands in the riparian area would also attract several species that currently do not occur there. Table 6.5-1 shows several species of concern, Federal and State, which may benefit from the proposed project. The created wetlands may create specific habitat requirements for the species listed in Table 6.5-1.

TABLE 6.5-1 SPECIES OF CONCERN THAT MAY BENEFIT FROM THE PROPOSED WETLAND CREATION

Habitat Type	Common Name	Scientific Name
Marsh		
	Southwestern Willow Flycatcher	*Empidonax traillii extimus*
	Long-billed Curlew	*Numenius americanus americanus*
	Occult little brown bat	*Myotis lucifugus occultus*
Wet Meadow		
	Parish's alkali grass	*Puccinellia parishi*
	Pecos sunflower	*Helianthus paradoxus*
	Northern leopard frog	*Rana pipiens*
	White-faced Ibis	*Plegdis chihi*
	Tawny-bellied cotton rat	*Sigmodon fulviventer*
	New Mexican jumping mouse	*Zapus hudsonius luteus*

(Crawford et al., 1993; NMDGF, 2002)

Vegetation

Both the created wetlands and the moist soil areas around Tingley Ponds would be planted with wetland plants. The adjacent upland area around the ponds would be planted with native species. Examples of the recommended species for these planting areas including the adjacent upland area are shown in Table 5.2-1.

Approximately 48 acres of exotic vegetation would be cleared from the understory in the riparian restoration/wetland creation project area. Native vegetation (i.e. cottonwoods and willows) would be preserved and protected to greatest extent possible. The area would be planted with native riparian or submergent and emergent wetland plants enhancing the plant diversity in the area.

Noxious Weeds and Invasive Species

Both of the occurring noxious species, Siberian elm and salt cedar, would be removed from the Tingley Pond area and the approximately 48 acres of riparian restoration and wetland creation project area. These areas will be replanted with native plants and monitored for initial invasion of these noxious species (see Section 5.2).

6.6 ENDANGERED AND PROTECTED SPECIES

The proposed project may affect 3 of the 8 Federally listed endangered, threatened or candidate species. The effects to these species are noted below.

Southwestern Willow Flycatcher

No migratory or breeding flycatchers have been identified in the project area. No suitable breeding habitat occurs within the project area although potentially suitable habitat is immediately adjacent. Migrating flycatchers may be displaced up or downstream from the construction area beginning in October 2003.

The proposed project would create open water and moist soil habitat along with planting willows in the bosque may actually promote Southwestern Willow Flycatcher breeding habitat over the life of the project. No flycatchers were detected during the survey performed in 2003. The proposed project may affect, not likely adversely affect the Southwestern Willow Flycatcher.

Bald Eagle

Several mature cottonwood trees adjacent to the channel, which may be used by foraging or resting Bald Eagles, would be affected by proposed activities. The proposed construction period, beginning in April 2004, would not overlap with the Bald Eagle's November-March winter season in New Mexico. Construction activities may temporarily disturb or displace Bald Eagles in the project area. To minimize direct disturbance to Bald Eagles the following precautions would be observed during project construction:

- If a Bald Eagle is present within 0.5 mile (0.4 km) upstream or downstream of the active construction site in the morning before project activity starts, or is present following breaks in project activity, the contractor would be required to suspend all activity until the bird leaves of its own volition; or a Corps biologist, in consultation with the Service, determines that the potential for harassment is minimal. However, if a Bald Eagle arrives during construction activities or if an eagle is greater than 0.5 mile away, construction need not be interrupted.

- If Bald Eagles were consistently found in the immediate project area during the construction period, the Corps would contact the USFWS to determine whether formal consultation under the Endangered Species Act is necessary.

The proposed project may affect, not likely adversely affect the Bald Eagle.

Rio Grande Silvery Minnow

Construction would not occur in the Rio Grande channel. All construction would occur in either in the floodplain (bosque) or outside the levee. However, the project area for the wetland restoration does occur in designated critical habitat for the Rio Grande silvery minnow (USFWS, 2003). The proposed project may affect, but will not adversely modify Rio Grande silvery minnow critical habitat. The proposed project may affect, not likely to adversely affect the Rio Grande silvery minnow.

Endangered Species Act Compliance Summary

Based on the analyses and information described above, the Corps has determined that the conduct of the proposed restoration project would not likely adversely affect the Southwestern Willow Flycatcher, Bald Eagle, and Rio Grande silvery minnow; nor would it destroy or adversely modify designated critical habitat of the Rio Grande silvery minnow.

6.7 CULTURAL RESOURCES

Tingley Beach has previously been determined to be eligible for listing to the National Register under criterion (a), association with important events in history, and criterion (b), associations with historically important persons. Previously proposed projects that called for the restoration of the Tingley Aquatic Park, if they would have been constructed, were considered to have had no adverse effect to historic properties. This proposed Section 1135restoration project's recommended plan would also have no effect on those elements that contribute to Tingley Beach's eligibility.

No archaeological sites or historic properties are known to occur in or near the project area. During surveys of the Tingley Beach area, only two isolated artifacts that are considered to be insignificant have been observed. No other prehistoric or historic artifacts, cultural resource manifestations, archaeological sites, or historic properties were observed during cultural surveys or site visits. While no intensive cultural resources survey was conducted for the proposed riparian and wetland creation area, documentation indicates that it would be highly unlikely that cultural resources of significant antiquity or archaeological integrity would occur in the project area due to the river's historic flood events or due to the significant earth moving activities that occurred in the project area between the 1930s and 1960s.

Rather than being detrimental, the proposed restoration project would provide for education emphasizing the Rio Grande ecosystem and human history of the area. The project would also maintain the historic environmental setting.

Based on this information, the Corps is of the opinion that there would be "No Adverse Effect to Historic Properties" by the proposed Purposed Project. Should previously unknown artifacts or cultural resource manifestations be encountered during construction, work would cease in the immediate vicinity of the resource, a determination of significance made and a mitigation plan formulated in consultation with the State Historic Preservation Officer, the Pueblo of Sandia, the Pueblo of Isleta, and any other Native American groups that may have interest or concerns in the project area.

6.8 LAND USES AND RECREATIONAL RESOURCES

There are no effects to current land uses in the project area as a result of the proposed project. No changes to land use designations would be made as a result of the proposed project.

Recreational land use, such as walking, biking, hiking, and jogging would increase with the proposed project. Recreational features within the wetland creation area would include a 5,100 linear foot trail system, educational signs, benches, and garbage cans. The trail system would traverse the restoration area while educational signs would inform observers of the ecological function and importance of each plant community.

Recreational resources around Tingley Ponds would be enhanced by greater fishing opportunities and improved trails and facilities. While the Tingley Ponds are under construction, no fishing opportunities would exist. However, these effects would be temporary and the new fishing opportunities would be greatly enhanced after the project is completed. The rainbow trout stocking and fishing opportunities would be extended from 5 months to approximately 10 months as a result of deeper ponds and the addition and recycling of water. The proposed plan conforms to City's Open Space plans.

6.9 SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE

The Proposed Action would benefit the socioeconomics environment of the City of Albuquerque. Potential effects would be associated with construction of the proposed project. Construction effects would include beneficial effects associated with localized purchases of material, equipment and supplies and the effects of additional worker salaries and income. In the immediate area, local revenue benefits would largely be limited to a demand for goods and services. Increased fishing opportunities may lead to an increase in fishing license sales; thus maintaining the put-and-take fishery.

No displacement, relocation, economic, or any other type or disproportionate effect to minority or low-income populations of the community would occur under the proposed project. Improving the ponds would enhance and improve the local area.

6.10 AESTHETICS

Aesthetics of the project area would improve by making the ponds larger and cleaner. The addition of native riparian and wetland vegetation in the area would also improve overall aesthetics in the project area. Wetland creation in the bosque would also improve the aesthetics of the area by creating wildlife habitat and enhancing biodiversity in the bosque. The aesthetic appreciation would increase and more people would prefer to use the project area.

6.11 HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE

There are no HTRW sites within the project area, therefore there are no effects to HTRW is expected from the proposed action.

SECTION 7 RECOMMENDATIONS

As District Engineer, Albuquerque District, U.S. Army Corps of Engineers, I have weighed the ecosystem benefits to be gained from implementing the recommended habitat restoration plan at Tingley Ponds and the adjacent bosque against the cost, and have considered the alternatives, impacts, and scope of the proposed project. In my judgment, the proposed project is a justified expenditure of Federal funds. The proposed project is fully consistent with the authorized purposes of Jemez Canyon and Cochiti Dams and would not have any effect on their operation or maintenance. I recommend that the Secretary of the Army approve the *Albuquerque Biological Park Wetland Restoration Project* in the City of Albuquerque.

Total estimated first cost of the project is $6,471,000. The project sponsor, the City of Albuquerque, non-Federal share is $1,618,000, of the total project cost. All future operation and maintenance responsibilities for the structures and features implemented in the recommended plan would be borne by the City of Albuquerque.

I further recommend that funds in the amount of $4,854,000 be allocated in fiscal year 2004 to complete plans and specifications and initiate construction.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of restoration projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted as proposals for implementation funding. However, prior to transmittal, the sponsor, the States, interested federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Dana R. Hurst

SECTION 8 PREPARTION, COORDINATION AND CONSULTATION

8.1 PREPARATION

This Detailed Project Report/Environmental Assessment was prepared by the U.S. Army Corps of Engineers, Albuquerque District. The Product Delivery Team and principal preparers included:

Albuquerque District Interdisciplinary Study Team:

Team Leader/Project Manager	Fritz Blake
Lead Planner/Hydrologist	April Fitzner
Economist	Robert Browning
Biologist	Patricia Phillips
Cost Engineering	Alan C de Baca
Archaeologist	Gregory Everhart
HTRW	Brian Jordan
Geotechnical	James McAdoo
Engineering	George Diewald
Real Estate	Michael Howell

Engineering Design Report
Fishpro a Division of HDR

The Los Angeles District Independent Technical Review Team consisted of:

Plan Formulation	Scott Estergard
Recreation	Debbie Lamb
Economics	Jeannine Hogg
Environmental/NEPA	Deanie Kennedy
Cost Engineering	Phil Eng
Civil Design	Roxanne Vidaurre
Hydrology and Hydraulics	Kerry Casey
Real Estate	Steve Gale

8.2 COORDINATION AND CONSULTATION

City of Albuquerque Biological Park
City of Albuquerque Open Space Division
Middle Rio Grande Conservancy District
City of Albuquerque Public Works Department
U.S. Fish and Wildlife Service
New Mexico State Historic Preservation Bureau
Natural Resource Conservation Service
Bernalillo County Department of Pubic Works

City of Albuquerque Transportation Division
Albuquerque Metropolitan Arroyo Flood Control Authority
Bureau of Land Management
New Mexico Interstate Stream Commission
Environmental Protection Agency
National Hispanic Cultural Center
New Mexico Natural Heritage Program
New Mexico Forestry and Resources Conservation Division
New Mexico Environment Department
U.S. Bureau of Reclamation
New Mexico State Engineer
New Mexico Department of Game and Fish

This proposed action has been coordinated with the U.S. Fish and Wildlife Service in compliance with the Fish and Wildlife Coordination Act of 1958 and the Endangered Species Act of 1973 (see Appendix B).

Coordination under Section 106 of the National Historic Preservation Act has been conducted with the New Mexico State Historic Preservation Officer (see Appendix C).

8.3 PUBLIC REVIEW AND COMMENT

To be completed after the public comment period has ended.

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